

## **FOREWORD**

This report is the forty-sixth in the IAEA's series of annual reports on operating experience with nuclear power stations in Member States.

As in previous years, in addition to annual performance data and outage information, the report contains a historical summary of performance and outages during the lifetime of individual plants and figures illustrating worldwide performance and statistical data. In order to provide enhanced features such as data searching and analysis, the report has been published electronically on a CD-ROM since 2006.

The intent behind this report and all related Agency publications is to provide a useful tool for everyone concerned with nuclear power. Suggestions and corrections from readers would be most welcome.

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# 1. INTRODUCTION

This report is the forty-sixth in the IAEA's series of annual publications on operating experience with nuclear power stations in Member States.

The publication provides annual performance data and outage information for individual nuclear power plants from around the world. Summaries of historical performance and outages during the lifetimes of those plants are also included. In order to provide a broad picture of nuclear power usage six figures have been added to illustrate global operational statistics through 2014.

The data which forms the basis of the publication is a direct output from the IAEA's Power Reactor Information System (PRIS), the databank of which contains all performance data published in the IAEA's operating experience annual reports since 1970, as well as basic information on power reactors, including design data. It presents operating experience data for all worldwide nuclear power plants from the start date of their commercial operation. The PRIS databank is available free of charge to IAEA Member States through its public website and on-line application PRIS-Statistics. The web-site [www.iaea.org/pris](http://www.iaea.org/pris) contains publicly available information about reactor units and nuclear industry results. PRIS-Statistics (<http://pris.iaea.org>) allows direct access to the database through the Internet. This application allows registered users to generate statistical outputs through pre-designed reports and filters.

When analysing the performance of nuclear reactors, indicators such as energy production, load, operation, and availability factors are often used. Energy unavailability factors, categorized separately for planned and unplanned unavailability (due either to causes under plant management control or external causes out of plant management control), are used as a measure of energy loss when a unit is not available to the grid on full power. Despite efforts to properly classify unavailability data, some ambiguity remains in the operators' reports since there is an inherent difficulty in finding energy losses caused by load following operation and by grid limitation for externally facilitated unavailabilities. Therefore, for load, operation, and unavailability factors, there may be differences between the data compiled in this report and data published elsewhere. In order to avoid confusion, refer to the definitions in Section 2.

As of 31 December 2014, there were 438 operational nuclear power reactors worldwide, with a total capacity of 376.2 GW(e). This represents an increase of some 4.5 GW(e) in total capacity, compared to the 2013 figures. There were five new grid connections in 2014: Atucha-2 in Argentina; Fangjiashan-1, Fuqing-1 and Ningde-2 in China; and Rostov-31 in Russia.

In Japan all 48 operational reactor units were kept off-line in 2014. This influenced worldwide statistics on nuclear power reactor performance.

Of the operational reactors, approximately 81.5% are light water moderated and cooled reactors; 11.2% are heavy water moderated and cooled reactors; 3.4% are light water cooled and graphite moderated reactors; and 3.4% are gas cooled reactors. Two reactors are liquid metal cooled fast reactors.

Three constructions of new reactors began during 2014; a figure that is significantly lower than the ten construction starts which occurred in 2013. Construction work started at Barakah-3 in the United Arab Emirates (UAE); Belarusian-2 in Belarus; and Carem in Argentina.

In 2014 one reactor unit, namely Vermont Yankee in the USA, was officially declared as permanently shutdown. This is five reactors fewer than in 2013.

As of 31 December 2014, 70 reactors were under construction. As in previous years, expansions as well as near and long term growth prospects remain centred in Asia, particularly in China. Of these 70 reactors under construction, 46 are in Asia, as are 32 of the last 40 new reactors to have been connected to the grid since 2004.

This report also catalogues the use of nuclear power reactors for non-electrical applications. Section 6 provides production data related to district heating, industrial process heat delivery, and water desalination. In 2014, 11 Member States utilized nuclear energy from 75 reactors for non-electrical applications.

Similarly to the previous year's edition, the 2015 edition contains detailed design characteristics of reactor units and dashboards with a general overview of each individual operating nuclear power reactor.

Information received by the IAEA through 8 April 2015 is included in this publication; All commercially operating units had reported data up to this date. Any modifications received at a later date, although not included in this publication, are available in the PRIS database.

The information contained in the report was made available to the IAEA through designated national correspondents. The IAEA appreciates the valuable assistance of the national authorities, official correspondents, and various electrical utilities in gathering the information for this report.

This report was compiled by staff of the Agency's Division of Nuclear Power. It is hoped that the report will serve as a useful tool for nuclear power plant operators, nuclear system designers, nuclear power planners, professional engineers, scientists, and others concerned with the operating experience of nuclear power reactors. Suggestions and corrections from readers are most welcome.

## 2. DEFINITIONS

### 1. Reference unit power, RUP [ $\text{MW}_{(e)}$ ]

The maximum (electrical) power that could be maintained continuously throughout a prolonged period of operation under reference ambient conditions.

It is specified that this value must remain constant for a given unit unless, following permanent modification, or a new permanent authorization, the management decides to amend the original value.

The reference unit power may be gross or net:

- The gross RUP ( $P_g$ ,  $\text{MW}_{(e)}$ ) is deemed to be measured at the output terminals of all generator sets in the station.
- The net RUP ( $P_n$ ,  $\text{MW}_{(e)}$ ), indicating the maximum power that can be supplied, is measured at the station outlet terminals, i.e. after deducting the power taken by station auxiliaries and the losses in the transformers that are considered integral parts of the station.

### 2. Design net capacity [ $\text{MW}_{(e)}$ ]

The net reference unit power as specified in an original unit design.

### 3. Reference period, T [hours]

For units in power ascension at the end of the period, the clock hours from the beginning of the period or the first electrical production, whichever comes last, to the end of the period.

For units in commercial operation at the end of the period, the clock hours from the beginning of the period or of commercial operation, whichever comes last, to the end of the period or permanent shutdown, whichever comes first.

### 4. On-line hours, t [hours]

The total clock hours in the reference period during which the unit operated with breakers closed to the station bus.

### 5. Reference energy generation, REG [ $\text{MW}_{(e)}\text{h}$ ]

Net electrical energy which would have been supplied to the grid if the unit were operated continuously at the reference unit power during the whole reference period.

### 6. Energy generated (net), EG [ $\text{GW}_{(e)}\text{h}$ ]

Net electrical energy produced during the reference period as measured at the unit outlet terminals, i.e. after deducting the electrical energy taken by unit auxiliaries and the losses in transformers that are considered integral parts of the unit. If this quantity is less than zero, zero is reported.



## 7. Load factor, LF [%]

$$LF = \frac{EG}{REG} \times 100$$

EG = energy generated (net), [MW<sub>(e)</sub>h]  
REG = reference energy generation [MW<sub>(e)</sub>h]

Load factor is the ratio of the energy that the power unit has produced over a given period, to the energy it would have produced at its reference power capacity over that period.

## 8. Operation factor, OF [%]

$$OF = \frac{t}{T} \times 100$$

t = number of hours on-line [h]  
T = number of hours in the reference period [h]

Operation factor is the ratio of the number of hours the unit was on-line, to the total number of hours in the reference period, expressed as a percentage. It is a measure of the unit time availability on the grid and does not depend on the operating power level.

## 9. Available capacity, P [MW<sub>(e)</sub>]

Maximum net capacity at a given moment at which the unit or station is able or is authorized to be operated at a continuous rating under the prevailing conditions assuming unlimited transmission facilities.

## 10. Energy loss, EL [MW<sub>(e)</sub>h]

Energy which could have been produced during the reference period by using the unavailable capacity; it is categorized into three types:

- PEL - planned energy loss
- UEL - unplanned energy loss
- XEL - energy loss due to causes external to the plant

UEL comprises shutdowns, unplanned load reductions or outage extensions.

## 11. Unavailability

A status when the plant is not able to operate at its maximum capacity (reference power). This condition, which may be under or beyond plant management control, should only reflect lack of availability of the plant itself, regardless of energy demand, transmission grid condition or political situation in the country.

Unavailability is classified as planned if it is foreseen at least 4 weeks in advance, generally at the time when the annual overhaul programme is established, and if the beginning of the unavailability period can be largely controlled and deferred by management. Unavailability is classified as unplanned if not scheduled at least four weeks in advance. Power plant operation at lower than maximum capacity because of lower demand from the grid but occurring while the plant is available to operate at the maximum capacity, does not constitute unavailability, either planned or unplanned.

## 12. Energy availability factor, EAF [%]

$$EAF = \frac{REG - PEL - UEL - XEL}{REG} \times 100$$

The energy availability factor is the ratio of the energy that the available capacity could have produced over a specified period, to the energy that the reference unit power could have produced during the same period.

### 13. Energy unavailability factor, EUF [%]

$$EUF = \frac{EL}{REG} \times 100$$

The unavailability factor is the ratio of the energy losses EL that have not been produced during a specified period due to the unavailable capacity, to the energy that the reference unit power could have produced during the same period.

The energy unavailability factor EUF over a specified period can be divided into:

PUF = planned unavailability factor

UUF = unplanned unavailability factor due to causes in the plant

XUF = unplanned unavailability factor due to causes external to the plant.

The unavailability factor can be expressed as:  $EUF = 100 - EAF$

### 14. Unit capability factor, UCF [%]

$$UCF = \frac{REG - PEL - UEL}{REG} \times 100$$

Unit capability factor is defined as the ratio of the energy that the unit was capable of generating over a given time period considering only limitation under the plant management control, to the reference energy generation over the same time period, expressed as a percentage. Both of these energy generation terms are determined relative to reference ambient conditions.

### 15. Unplanned capability loss factor, UCL [%]

$$UCL = \frac{UEL}{REG} \times 100$$

Unplanned capability loss factor is defined as the ratio of the unplanned energy losses during a given period of time, to the reference energy generation, expressed as a percentage. Unplanned energy loss is energy that was not produced during the period because of unplanned shutdowns, outage extensions, or unplanned load reductions due to causes under plant management control. Causes of energy losses are considered to be unplanned if they are not scheduled at least four weeks in advance.

### 16. Construction start

Date when first major placing of concrete, usually for the base mat of the reactor building, is carried out.

### 17. First criticality

Date when the reactor is made critical for the first time.

### 18. Grid connection

Date when the plant is first connected to the electrical grid to supply power.

### 19. Commercial operation

Date when the plant is handed over by the contractors to the owner and officially declared to be in commercial operation.

## **20. Permanent shutdown**

Date when the plant is officially declared shut down by the owner and taken out of operation permanently.

## **21. Long term shutdown (Suspended operation)**

A unit is considered in the long term shutdown status, if it has been shut down for an extended period (usually several years) without initially having any firm recovery schedule but where there is the intention of re-starting the unit eventually.

## **22. Outages**

For the purpose of PRIS coding, the outage is defined as any status of a reactor unit, when its actual output power is lower than the reference unit power for a period of time. By this definition, the outage includes both power reduction and unit shutdown. The outage is considered significant, if the loss in the energy production corresponds to at least ten hours of continuous operation at the reference unit power or if it has been caused by an unplanned reactor scram (even if the unit is shut down for less than 10 hours).

## **23. Outage duration [h]**

The total clock hours of the outage measured from the beginning of the reference period or the outage, whichever comes last, to the end of the reference period or the outage, whichever comes first.

**24. Factors** refer to the plants which were in commercial operation during the whole of the reference period.

**25. Cumulative factors** are given for the plants which were in commercial operation during full calendar years.

**26.** A blank and three periods (...), if used in tables, denote information that is not applicable or not available, respectively.

## **27. Types of outages**

The outage type is a three-character code. The third character is for unplanned outages only:

Code\_1 description:

- (P) Planned outage due to causes under the plant management control
- (U) Unplanned outage due to causes under the plant management control
- (X) Outage due to causes beyond the plant management control ("external")

Code\_2 description:

- (F) Full outage
- (P) Partial outage

Code\_3 description:

- (1) Controlled shutdown or load reduction that could be deferred but had to be performed earlier than four weeks after the cause occurred or before the next refueling outage, whatever comes first
- (2) Controlled shutdown or load reduction that had to be performed in the next 24 hours after the cause occurred
- (3) Extension of planned outage
- (4) Reactor scram, automatic
- (5) Reactor scram, manual

## **28. Main causes of outages**

- (A) Plant equipment failure
- (B) Refuelling without maintenance
- (C) Inspection, maintenance or repair combined with refuelling
- (D) Inspection, maintenance or repair without refuelling
- (E) Testing of plant systems or components
- (F) Major back-fitting, refurbishment or upgrading activities with refuelling
- (G) Major back-fitting, refurbishment or upgrading activities without refuelling
- (H) Nuclear regulatory requirements
- (J) Grid failure or grid unavailability
- (K) Load-following (frequency control, reserve shutdown due to reduced energy demand)
- (L) Human factor related
- (M) Governmental requirements or Court decisions
- (N) Environmental conditions (flood, storm, lightning, lack of cooling water due to dry weather, cooling water temperature limits etc.)
- (P) Fire
- (R) External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant, spare part delivery problems etc.)
- (S) Fuel management limitation (including high flux tilt, stretch out or coast-down operation)
- (T) Heat supply (on-site to support next unit or desalination and off-site distribution)
- (U) Security and access control and other preventive shutdown due to external threats
- (Z) Others

## **29. Plant systems affected**

### Nuclear Systems

- 11.00 Reactor and Accessories
  - 11.01 Reactor vessel and main shielding (including penetrations and nozzles)
  - 11.02 Reactor core (including fuel assemblies)
  - 11.03 Reactor internals (including steam separators/dryers - BWR, graphite, pressure tubes)
  - 11.04 Auxiliary shielding and heat insulation
  - 11.05 Moderator and auxiliaries (PHWR)
  - 11.06 Annulus gas system (PHWR/RBMK)
  - 11.99 None of the above systems
- 12.00 Reactor I&C Systems
  - 12.01 Control and safety rods (including drives and special power supply)
  - 12.02 Neutron monitoring (in-core and ex-core)
  - 12.03 Reactor instrumentation (except neutron)
  - 12.04 Reactor control system
  - 12.05 Reactor protection system
  - 12.06 Process computer
  - 12.07 Reactor recirculation control (BWR)
  - 12.99 None of the above systems
- 13.00 Reactor Auxiliary Systems
  - 13.01 Primary coolant treatment and clean-up system

- 13.02 Chemical and volume control system
- 13.03 Residual heat removal system (including heat exchangers)
- 13.04 Component cooling system
- 13.05 Gaseous, liquid and solid radwaste treatment systems
- 13.06 Nuclear building ventilation and containment inerting system
- 13.07 Nuclear equipment venting and drainage system (including room floor drainage)
- 13.08 Borated or refuelling water storage system
- 13.09 CO<sub>2</sub> injection and storage system (GCR)
- 13.10 Sodium heating system (FBR)
- 13.11 Primary pump oil system (including RCP or make-up pump oil)
- 13.12 D<sub>2</sub>O leakage collection and dryer system (PHWR)
- 13.13 Essential auxiliary systems (GCR)
- 13.99 None of the above systems

#### 14.00 Safety Systems

- 14.01 Emergency core cooling systems (including accumulators and core spray system)
- 14.02 High pressure safety injection and emergency poisoning system
- 14.03 Auxiliary and emergency feedwater system
- 14.04 Containment spray system (active)
- 14.05 Containment pressure suppression system (passive)
- 14.06 Containment isolation system (isolation valves, doors, locks and penetrations)
- 14.07 Containment structures
- 14.08 Fire protection system
- 14.99 None of the above systems

#### 15.00 Reactor Cooling Systems

- 15.01 Reactor coolant pumps/blowers and drives
- 15.02 Reactor coolant piping (including associated valves)
- 15.03 Reactor coolant safety and relief valves (including relief tank)
- 15.04 Reactor coolant pressure control system
- 15.05 Main steam piping and isolation valves (BWR)
- 15.99 None of the above systems

#### 16.00 Steam generation systems

- 16.01 Steam generator (PWR), boiler (PHWR, AGR), steam drum vessel (RBMK, BWR)
- 16.02 Steam generator blowdown system
- 16.03 Steam drum level control system (RBMK, BWR)
- 16.99 None of the above systems

#### 17.00 Safety I&C Systems (excluding reactor I&C)

- 17.01 Engineered safeguard feature actuation system
- 17.02 Fire detection system
- 17.03 Containment isolation function
- 17.04 Main steam/feedwater isolation function
- 17.05 Main steam pressure emergency control system (turbine bypass and steam dump valve control)
- 17.06 Failed fuel detection system (DN monitoring system for PHWR)

17.07 RCS integrity monitoring system (RBMK)

17.99 None of the above systems

Fuel and Refuelling Systems

21.00 Fuel Handling and Storage Facilities

21.01 On-power refuelling machine

21.02 Fuel transfer system

21.03 Storage facilities, including treatment plant and final loading and cask handling facilities

21.99 None of the above systems

## Secondary plant systems

- 31.00 Turbine and auxiliaries
  - 31.01 Turbine
  - 31.02 Moisture separator and reheater
  - 31.03 Turbine control valves and stop valves
  - 31.04 Main condenser (including vacuum system)
  - 31.05 Turbine by-pass valves
  - 31.06 Turbine auxiliaries (lubricating oil, gland steam, steam extraction)
  - 31.07 Turbine control and protection system
  - 31.99 None of the above systems
  
- 32.00 Feedwater and Main Steam System
  - 32.01 Main steam piping and valves
  - 32.02 Main steam safety and relief valves
  - 32.03 Feedwater system (including feedwater tank, piping, pumps and heaters)
  - 32.04 Condensate system (including condensate pumps, piping and heaters)
  - 32.05 Condensate treatment system
  - 32.99 None of the above systems
  
- 33.00 Circulating Water System
  - 33.01 Circulating water system (pumps and piping/ducts excluding heat sink system)
  - 33.02 Cooling towers / heat sink system
  - 33.03 Emergency ultimate heat sink system
  - 33.99 None of the above systems
  
- 34.00 Miscellaneous Systems
  - 34.01 Compressed air (essential and non-essential / high-pressure and low-pressure)
  - 34.02 Gas storage, supply and cleanup systems (nitrogen, hydrogen, carbon dioxide etc.)
  - 34.03 Service water / process water supply system (including water treatment)
  - 34.04 Demineralized water supply system (including water treatment)
  - 34.05 Auxiliary steam supply system (including boilers and pressure control equipment)
  - 34.06 Non-nuclear area ventilation (including main control room)
  - 34.07 Chilled water supply system
  - 34.08 Chemical additive injection and makeup systems
  - 34.09 Non-nuclear equipment venting and drainage system
  - 34.10 Communication system
  - 34.99 None of the above systems
  
- 35.00 All other I&C Systems
  - 35.01 Plant process monitoring systems (excluding process computer)
  - 35.02 Leak monitoring systems
  - 35.03 Alarm annunciation system
  - 35.04 Plant radiation monitoring system
  - 35.05 Plant process control systems
  - 35.99 None of the above systems

### Electrical Systems

- 41.00 Main Generator Systems
  - 41.01 Generator and exciter (including generator output breaker)
  - 41.02 Sealing oil system
  - 41.03 Rotor cooling gas system
  - 41.04 Stator cooling water system
  - 41.05 Main generator control and protection system
  - 41.99 None of the above systems
  
- 42.00 Electrical Power Supply Systems
  - 42.01 Main transformers
  - 42.02 Unit self-consumption transformers (station, auxiliary, house reserve etc.)
  - 42.03 Vital AC and DC plant power supply systems (medium and low voltage)
  - 42.04 Non-vital AC plant power supply system (medium and low voltage)
  - 42.05 Emergency power generation system (e.g. emergency diesel generator and auxiliaries)
  - 42.06 Power supply system logics (including load shed logic, emergency bus transfer logic, load sequencer logic, breaker trip logic etc.)
  - 42.07 Plant switchyard equipment
  - 42.99 None of the above systems

*Note: Detailed definitions of performance indicators and PRIS related terms can be found in the IAEA - Technical Reports Series No. 428: "The Power Reactor Information System (PRIS) and its Extension to Non-electrical Applications, Decommissioning and Delayed Projects Information", IAEA, Vienna (2005)*



### 3. ABBREVIATIONS

#### COUNTRY CODES

AM	ARMENIA
AR	ARGENTINA
BE	BELGIUM
BG	BULGARIA
BR	BRAZIL
CA	CANADA
CH	SWITZERLAND
CN	CHINA
CZ	CZECH REPUBLIC
DE	GERMANY
ES	SPAIN
FI	FINLAND
FR	FRANCE
GB	UNITED KINGDOM
HU	HUNGARY
IN	INDIA
IR	ISLAMIC REPUBLIC OF IRAN
JP	JAPAN
KR	KOREA, REPUBLIC OF
MX	MEXICO
NL	NETHERLANDS
PK	PAKISTAN
RO	ROMANIA
RU	RUSSIAN FEDERATION
SE	SWEDEN
SI	SLOVENIA
SK	SLOVAK REPUBLIC
TW	TAIWAN, CHINA
UA	UKRAINE
US	UNITED STATES OF AMERICA
ZA	SOUTH AFRICA

#### REACTOR TYPES

BWR	BOILING LIGHT-WATER-COOLED AND MODERATED REACTOR
FBR	FAST BREEDER REACTOR
GCR	GAS-COOLED, GRAPHITE-MODERATED REACTOR
LWGR	LIGHT-WATER-COOLED, GRAPHITE-MODERATED REACTOR
PHWR	PRESSURIZED HEAVY-WATER-MODERATED AND COOLED REACTOR
PWR	PRESSURIZED LIGHT-WATER-MODERATED AND COOLED REACTOR

## OPERATORS

AEP	AMERICAN ELECTRIC POWER COMPANY, INC.
AmerenUE	AMEREN UE, UNION ELECTRIC COMPANY
ANAV	ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID)
ANPPCJSC	CLOSED JOINT STOCK COMPANY ARMENIAN NPP
APS	ARIZONA PUBLIC SERVICE CO.
Axpo AG	KERNKRAFTWERK BEZNAU
BKW	BKW ENERGIE AG
BRUCEPOW	BRUCE POWER
CEZ	CZECH POWER CO., CEZ A.S.
CFE	COMISION FEDERAL DE ELECTRICIDAD
CHUBU	CHUBU ELECTRIC POWER CO.,INC
CHUGOKU	THE CHUGOKU ELECTRIC POWER CO.,INC.
CIAE	CHINA INSTITUTE OF ATOMIC ENERGY
CNAT	CENTRALES NUCLEARES ALMARAZ-TRILLO
CNNO	CNNC NUCLEAR OPERARION MANAGEMENT COMPANY LIMITED.
DNMC	DAYA BAY NUCLEAR POWER OPERATIONS AND MANAGEMENT CO,LTD.
DOMINION	DOMINION GENERATION
DTEDISON	DETROIT EDISON CO.
DUKEENER	DUKE ENERGY CORP.
E.ON	E.ON KERNKRAFT GMBH
EDF	ELECTRICITE DE FRANCE
EDF UK	EDF ENERGY
ELECTRAB	ELECTRABEL
ELETRONU	ELETROBRAS ELETRONUCLEAR S.A.
ENERGYNW	ENERGY NORTHWEST
EnKK	ENBW KERNKRAFT GMBH (SITZ IN OBRIGHEIM)
ENTERGY	ENTERGY NUCLEAR OPERATIONS, INC.
EPZ	N.V. ELEKTRICITEITS-PRODUKTIEMAATSCHAPPIJ ZUID-NEDERLAND
ESKOM	ESKOM
EXELON	EXELON GENERATION CO., LLC
FENOC	FIRST ENERGY NUCLEAR OPERATING CO.
FKA	FORSMARK KRAFTGRUPP AB
FORTUMPH	FORTUM POWER AND HEAT OY (FORMER IVO)
FPL	FLORIDA POWER & LIGHT CO.
FQNP	CNNC FUJIAN FUQING NUCLEAR POWER CO.,LTD
HEPCO	HOKKAIDO ELECTRIC POWER CO.,INC.
HOKURIKU	HOKURIKU ELECTRIC POWER CO.
ID	IBERDROLA, S.A.
JAPCO	JAPAN ATOMIC POWER CO.
JNPC	JIANGSU NUCLEAR POWER CORPORATION
KEPCO	KANSAI ELECTRIC POWER CO.
KGG	KERNKRAFTWERK GUNDREMMINGEN GMBH
KHNP	KOREA HYDRO AND NUCLEAR POWER CO.
KKG	KERNKRAFTWERK GOESGEN-DAENIKEN AG
KKL	KERNKRAFTWERK LEIBSTADT
KLE	KERNKRAFTWERKE LIPPE-EMS GMBH
KOZNPP	KOZLODUY NPP PLC
KWG	GEMEINSCHAFTSKERNKRAFTWERK GROHNDE GMBH & CO. OHG
KYUSHU	KYUSHU ELECTRIC POWER CO.,INC.
LHNPC	LIAONING HONGYANHE NUCLEAR POWER CO. LTD. (LHNPC)
LUMINANT	LUMINANT GENERATION COMPANY LLC
ML	MAGNOX LIMITED

NASA	NUCLEOELECTRICA ARGENTINA S.A.
NBEP	NEW BRUNSWICK ELECTRIC POWER COMMISSION
NDNP	FUJIAN NINGDE NUCLEAR POWER COMPANY LTD.
NEK	NUKLERANA ELEKTRARNA KRŠKO
NEXTERA	NEXTERA ENERGY RESOURCES, LLC
NNEGC	NATIONAL NUCLEAR ENERGY GENERATING COMPANY 'ENERGOATOM
NPCIL	'NUCLEAR POWER CORPORATION OF INDIA LTD.
NPPDCO	NUCLEAR POWER PRODUCTION & DEVELOPEMENT CO. OF IRAN
NPQJVC	NUCLEAR POWER PLANT QINSHAN JOINT VENTURE COMPANY LTD.
NSP	NORTHERN STATES POWER CO. (SUBSIDIARY OF XCEL ENERGY)
OKG	OKG AKTIEBOLAG
OPG	ONTARIO POWER GENERATION
OPPD	OMAHA PUBLIC POWER DISTRICT
PAEC	PAKISTAN ATOMIC ENERGY COMMISSION
PAKS Zrt	PAKS NUCLEAR POWER PLANT LTD
PG&E	PACIFIC GAS AND ELECTRIC COMPANY
PPL_SUSQ	PPL SUSQUEHANNA, LLC
PROGRESS	PROGRESS ENERGY
PSEG	PSEG NUCLEAR LLC
QNPC	QINSHAN NUCLEAR POWER COMPANY
RAB	RINGHALS AB
REA	JOINT STOCK COMPANY 'CONCERN ROSENERGOATOM'
SCE&G	SOUTH CAROLINA ELECTRIC & GAS CO.
SE,plc	SLOVENSKÉ ELEKTRÁRNE, A.S.
SHIKOKU	SHIKOKU ELECTRIC POWER CO.,INC
SNN	SOCIETATEA NATIONALA NUCLEARELECTRICA S.A.
SOUTHERN	SOUTHERN NUCLEAR OPERATING COMPANY, INC.
STP	STP NUCLEAR OPERATING CO.
TEPCO	TOKYO ELECTRIC POWER COMPANY
TOHOKU	TOHOKU ELECTRIC POWER CO., INC
TPC	TAIWAN POWER CO.
TQNPC	THE THIRD QINSHAN JOINTED VENTURE COMPANY LTDA.
TVA	TENNESSEE VALLEY AUTHORITY
TVO	TEOLLISUUDEN VOIMA OYJ
WCNOC	WOLF CREEK NUCLEAR OPERATION CORP.
YJNPC	YANGJIANG NUCLEAR POWER COMPANY

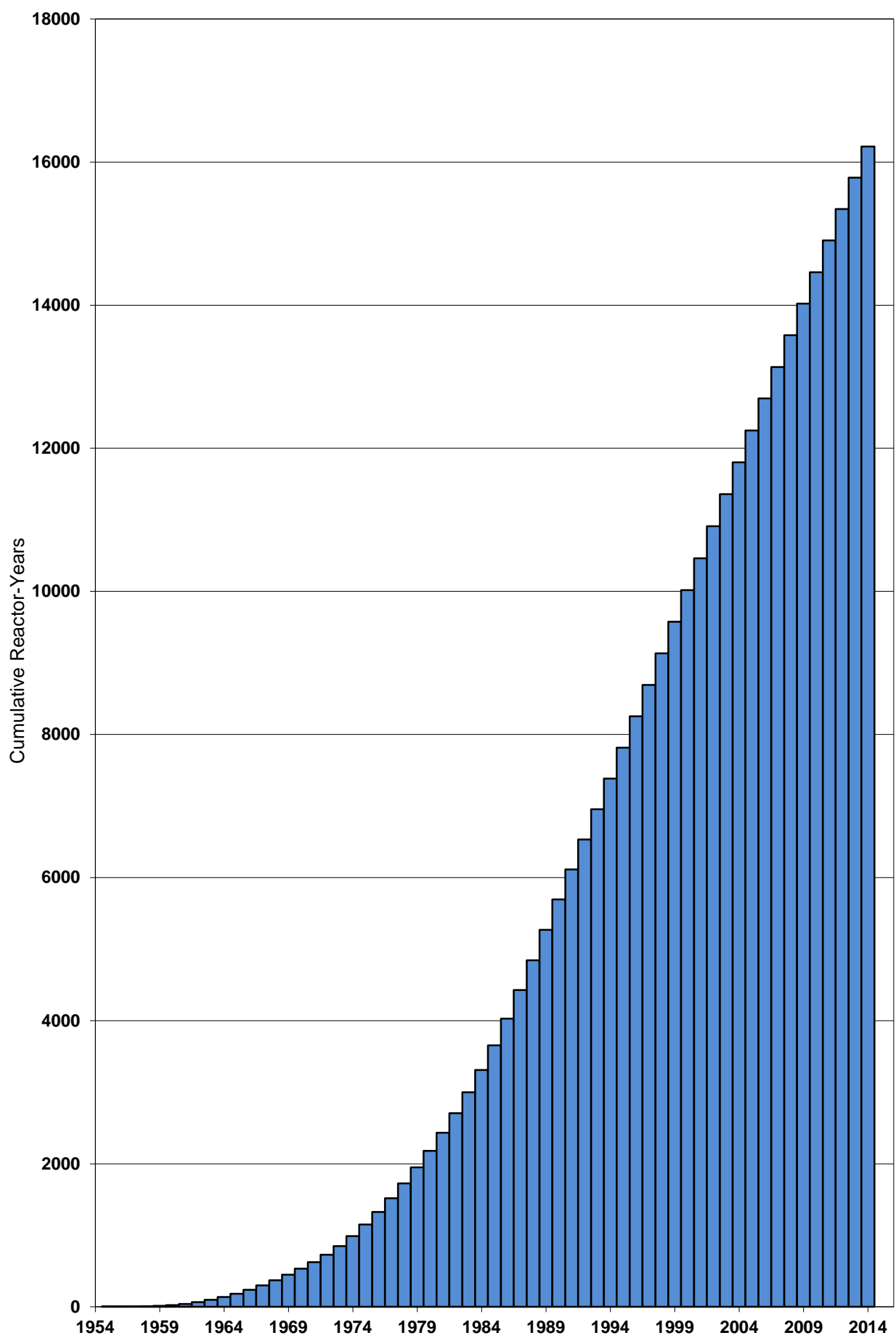
## REACTOR SUPPLIERS

ABBATOM	ABB_ATOM (FORMERLY ASEA-ATOM)
ACECOWEN	ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE )
ACLF	(ACECOWEN - CREUSOT LOIRE - FRAMATOME)
AECL	ATOMIC ENERGY OF CANADA LTD.
AECL/DAE	ATOMIC ENERGY OF CANADA LTD/ DEPARTMENT OF ATOMIC ENERGY (INDIA)
AECL/DHI	ATOMIC ENERGY OF CANADA LTD./DOOSAN HEAVY INDUSTRY & CONSTRUCTION
AEE	ATOMENERGOEXPORT
APC	ATOMIC POWER CONSTRUCTION LTD.
ASE	JOINT-STOCK COMPANY ATOMSTROYEXPORT
ASEASTAL	ASEA-ATOM / STAL-LAVAL
B&W	BABCOCK & WILCOX CO.
CE	COMBUSTION ENGINEERING CO.
CFHI	CHINA FIRST HEAVY INDUSTRIES
CGE	CANADIAN GENERAL ELECTRIC

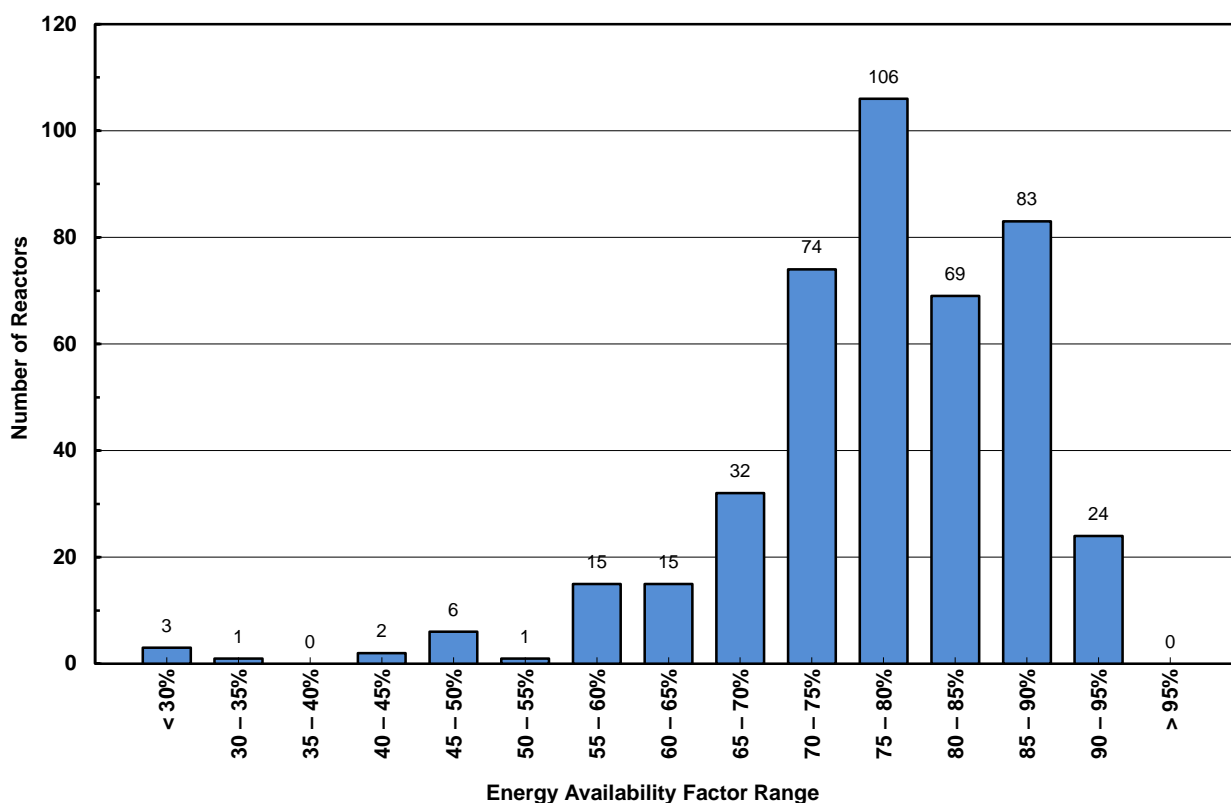
CNNC	CHINA NATIONAL NUCLEAR CORPORATION
DEC	DONGFANG ELECTRIC CORPORATION DEC-NPIC-FANP
DHICKAEC	DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA ATOMICENERGY RESEARCH INSTITUTE/COMBUSTIONENGINEERING
DHICKOPC	DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPANY/COMBUSTIONENGINEERING
EE/B&W/T	THE ENGLISH ELECTRIC CO. LTD / BABCOCK & WILCOX CO. / TAYLOR WOODROW CONSTRUCTION LTD.
FAEA	FEDERAL ATOMIC ENERGY AGENCY
FRAM	FRAMATOME
FRAMACEC	FRAMACECO ( FRAMATOME-ACEC-COCKERILL )
GE	GENERAL ELECTRIC CO.
GETSCO	GENERAL ELECTRIC TECHNICAL SERVICES CO.
HITACHI	HITACHI LTD.
IZ	IZHORSKIYE ZAVODY
KWU	SIEMENS KRAFTWERK UNION AG
MAEP	MINATOMENERGOPROM, MINISTRY OF NUCLEAR POWER AND INDUSTRY
MHI	mitsubishi heavy industries ltd.
NNC	NATIONAL NUCLEAR CORPORATION
NPC	NUCLEAR POWER CO. LTD.
NPCIL	NUCLEAR POWER CORPORATION OF INDIA LTD. VIKRAM SARABHAI BHAVAN, ANUSHAKTI NAGAR, MUMBAI - 400 094.
NPIC	NUCLEAR POWER INSTITUTE OF CHINA
OH/AECL	ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.
PAA	PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK
PAIP	PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA
PPC	PWR POWER PROJECTS LTD
ROSATOM	STATE ATOMIC ENERGY CORPORATION "ROSATOM"
S/KWU	SIEMENS/KRAFTWERK UNION AG
SHE	SHANGHAI ELECTRIC
SIEMENS	SIEMENS AG, POWER GENERATION
SKODA	SKODA CONCERN NUCLEAR POWER PLANT WORKS
TNPG	THE NUCLEAR POWER GROUP LTD.
TOSHIBA	TOSHIBA CORPORATION
WH	WESTINGHOUSE ELECTRIC CORPORATION
WH/MHI	WESTINGHOUSE ELECTRIC CORPORATION / MITSUBISHI HEAVY INDUSTRIES LTD.

## **4. FIGURES**

1. Nuclear Power Reactors Operating Experience Years
2. Lifetime Energy Availability Factors up to 2014
3. Reactors with High Availability Factors for years 1981-2014
4. Average Energy Availability Factors for years 1981-2014
5. Number of Reactors in Operation (as of 31 December 2014)
6. Number of Reactors by Age (as of 31 December 2014)

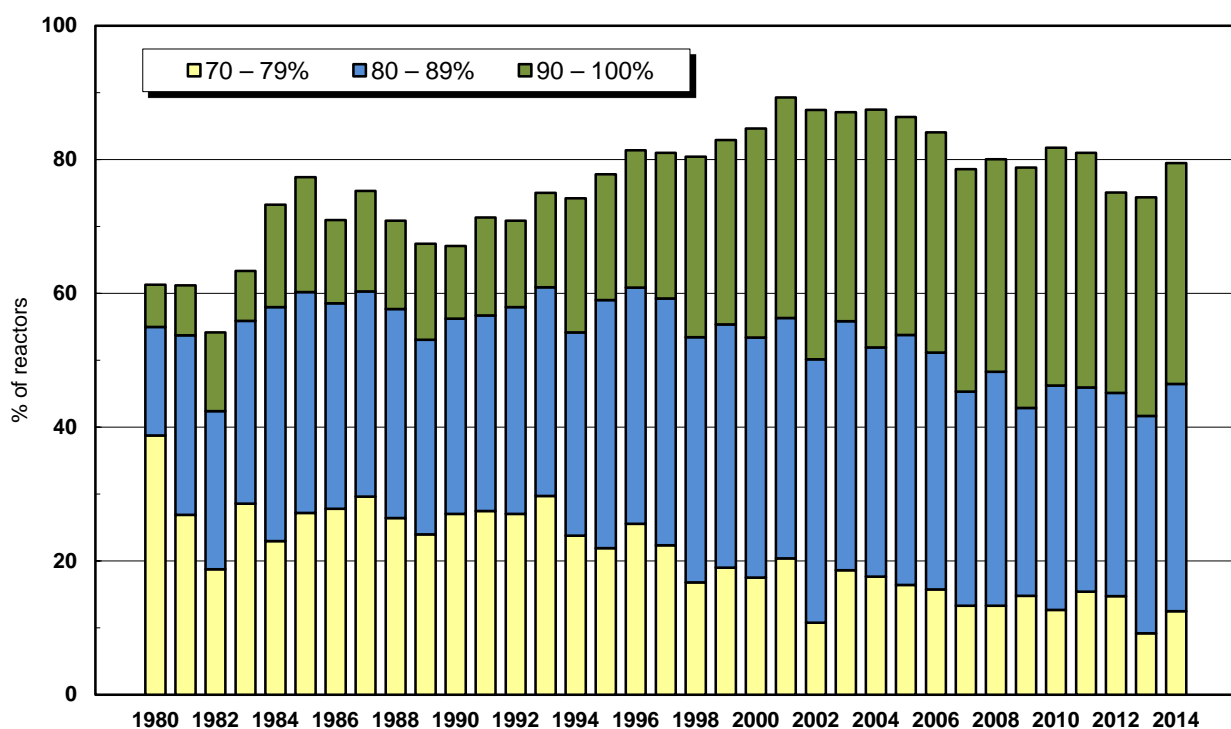


**Figure 1 — Nuclear Power Reactors Operating Experience**



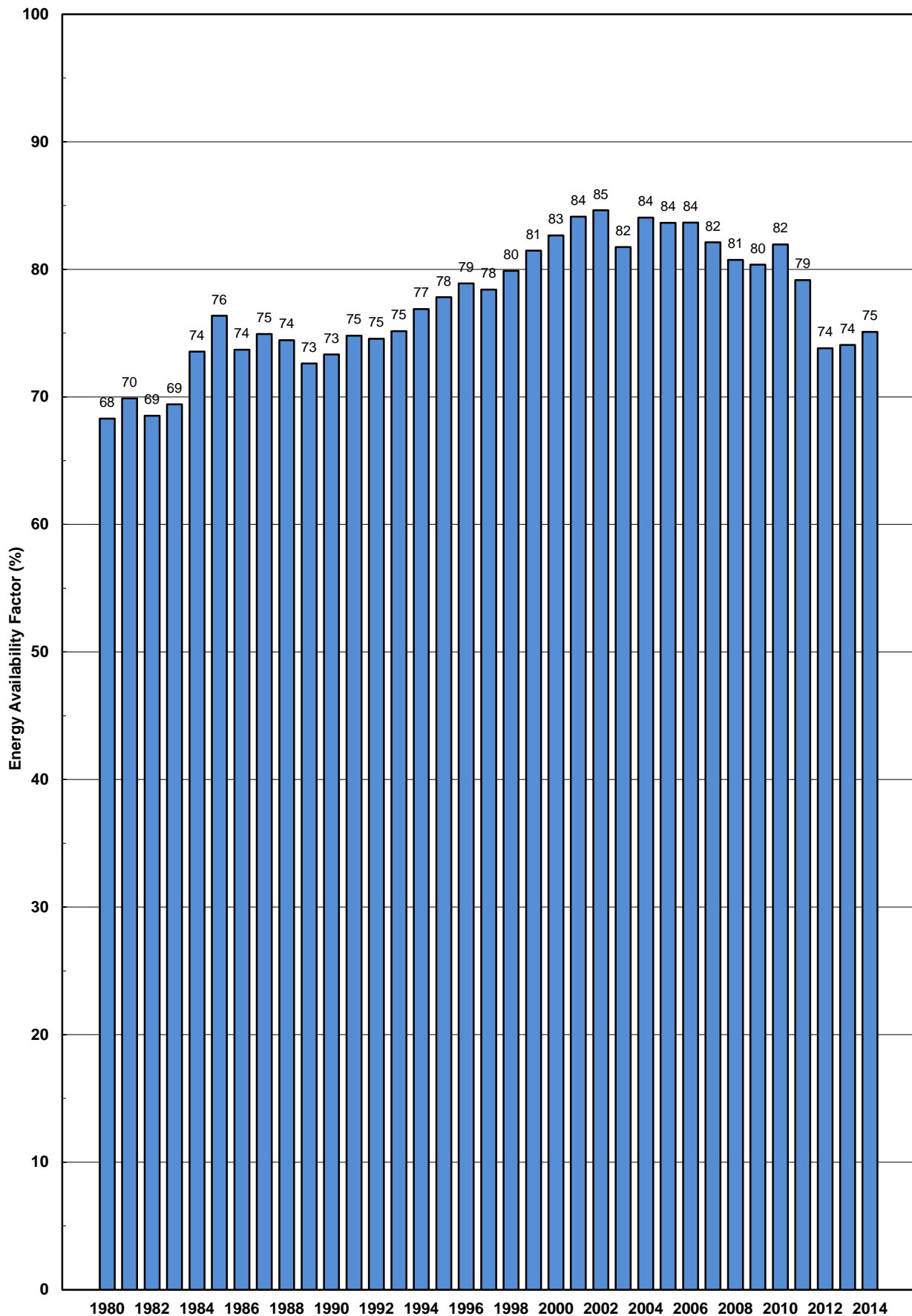
**Figure 2 — Lifetime Energy Availability Factors up to 2014**

(only reactors with capacity greater than 100 MW(e) and with more than one year of commercial operation)



**Figure 3 — Reactors with High Availability Factors**

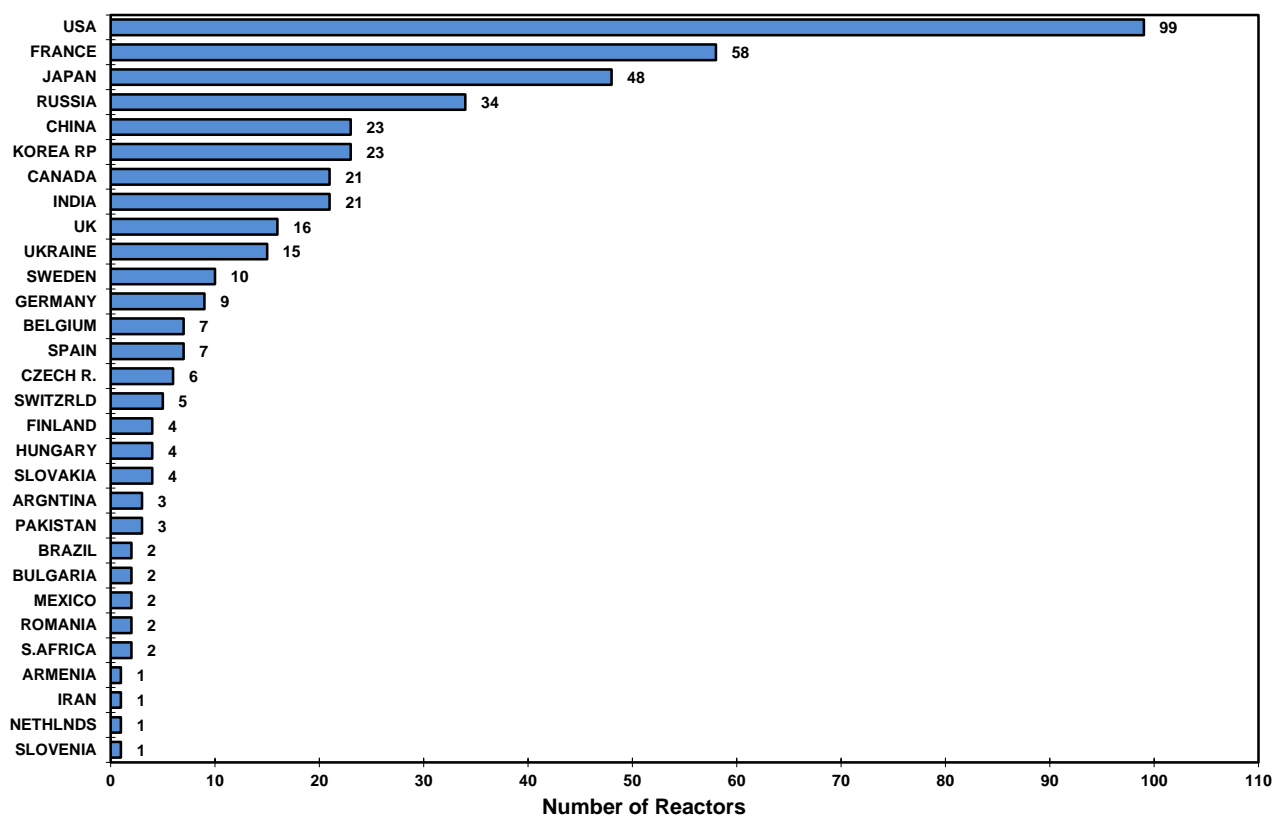
(only reactors with capacity greater than 100 MW(e) and with more than one year of commercial operation)



**Figure 4 — Average Energy Availability Factors**

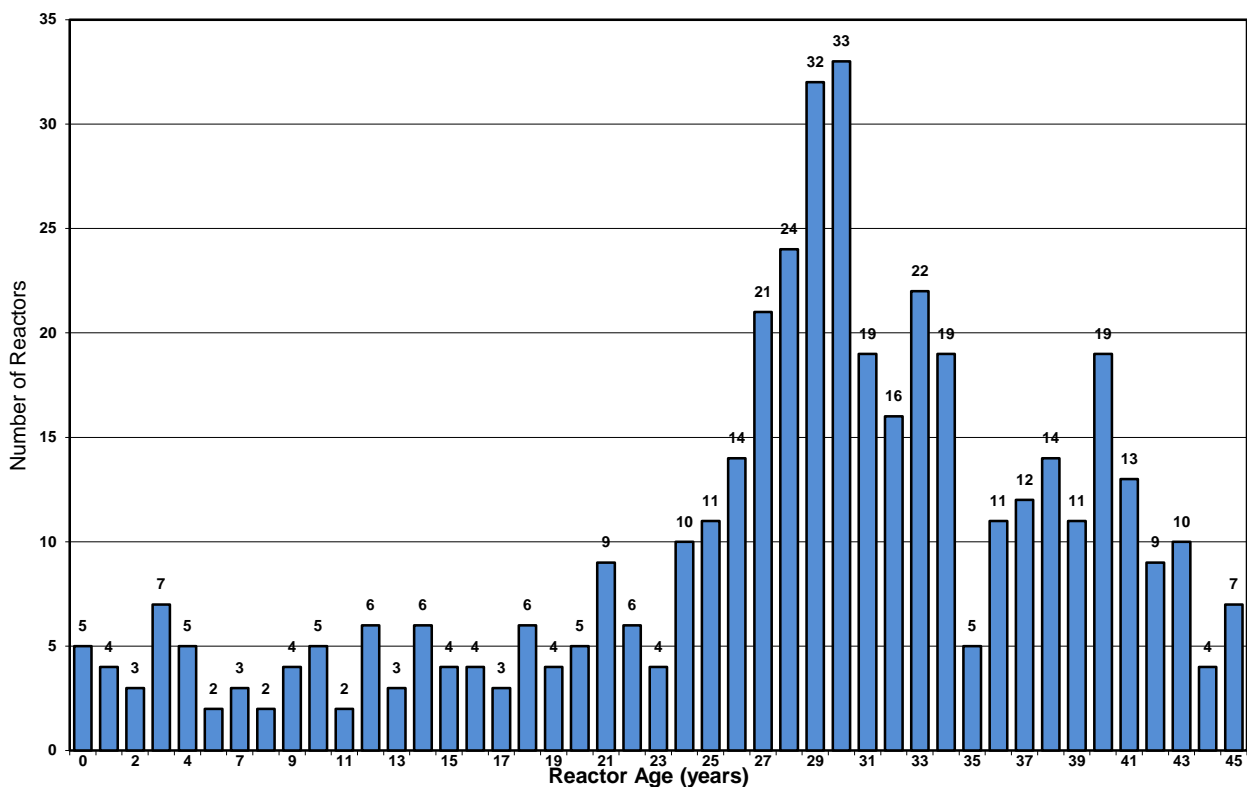
(only reactors with capacity greater than 100 MW(e) and with more than one year of commercial operation)





**Figure 5 — Number of Reactors in Operation (as of 31 December 2014)**

Note: There were 6 reactors in operation in Taiwan, China.



**Figure 6 — Number of Reactors by Age (as of 31 December 2014)**

## 5. OPERATING DATA SHEETS ON INDIVIDUAL NUCLEAR POWER STATIONS UNITS

<u>COUNTRY</u>	<u>NUMBER OF REACTORS OPERATED IN 2014</u>
ARGENTINA	3
ARMENIA	1
BELGIUM	7
BRAZIL	2
BULGARIA	2
CANADA	19
CHINA	
MAINLAND	23
TAIWAN, CHINA	6
CZECH REPUBLIC	6
FINLAND	4
FRANCE	58
GERMANY	9
HUNGARY	4
INDIA	21
ISLAMIC REPUBLIC OF IRAN	1
JAPAN	48
KOREA, REPUBLIC OF	23
MEXICO	2
NETHERLANDS	1
PAKISTAN	3
ROMANIA	2
RUSSIAN FEDERATION	34
SLOVAK REPUBLIC	4
SLOVENIA	1
SOUTH AFRICA	2
SPAIN	7
SWEDEN	10
SWITZERLAND	5
UKRAINE	15
UNITED KINGDOM	16
UNITED STATES OF AMERICA	99

# AR-1 ATUCHA-1

**Operator:** NASA (NUCLEOELECTRICA ARGENTINA S.A.)

**Contractor:** SIEMENS (Siemens AG, Power Generation)

## 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 335.0 MW(e)  
**Design Net Capacity:** 319.0 MW(e)  
**Design Discharge Burnup:** 11140 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 2631.7 GW(e)·h  
**Energy Availability Factor:** 88.6%  
**Load Factor:** 89.7%  
**Operating Factor:** 89.9%  
**Energy Unavailability Factor:** 11.4%  
**Total Off-line Time:** 885 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	245.7	224.0	249.4	242.8	252.5	246.2	254.2	252.9	31.4	145.7	241.0	246.1	2631.7
<b>EAF (%)</b>	99.7	99.5	99.2	99.3	99.5	100.0	99.9	99.4	11.7	57.2	99.2	98.5	88.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	11.8	57.3	100.0	100.0	89.1
<b>LF (%)</b>	98.6	99.5	100.1	100.6	101.3	102.1	102.0	101.5	13.0	58.4	99.9	98.7	89.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	13.3	64.9	100.0	100.0	89.9
<b>EUf (%)</b>	0.3	0.5	0.8	0.7	0.5	0.0	0.1	0.6	88.3	42.8	0.8	1.5	11.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.2	20.2	0.0	0.0	9.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.6	0.0	0.0	1.9
<b>XUF (%)</b>	0.3	0.5	0.8	0.7	0.5	0.0	0.1	0.6	0.0	0.0	0.8	1.5	0.5

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1968  
**Date of First Criticality:** 13 Jan 1974  
**Date of Grid Connection:** 19 Mar 1974  
**Date of Commercial Operation:** 24 Jun 1974

**Lifetime Generation:** 85035.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 73.7%  
**Cumulative Load Factor:** 71.5%  
**Cumulative Unit Capability Factor:** 74.8%  
**Cumulative Energy Unavailability Factor:** 26.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	831.3	321	51.5	51.5	50.7	50.7	50.7	50.7	3592	69.9
1975	2357.8	319	85.6	73.0	85.6	72.7	84.4	71.9	7730	88.2
1976	2408.6	319	86.9	78.4	86.9	78.2	86.0	77.4	7808	88.9
1977	1537.0	336	53.0	71.0	53.0	70.9	52.1	70.1	4650	53.1
1978	2711.8	345	90.9	75.6	90.9	75.5	89.7	74.6	8026	91.6
1979	2503.7	335	84.1	77.1	84.1	77.1	85.3	76.5	7551	86.2
1980	2180.5	335	73.5	76.6	73.5	76.5	74.1	76.2	6947	79.1
1981	2647.6	335	89.7	78.3	89.7	78.3	90.2	78.0	8120	92.7
1982	1753.6	335	59.2	76.1	59.2	76.0	59.8	75.9	5600	63.9
1983	2356.0	335	78.4	76.3	78.4	76.3	80.3	76.3	8101	92.5
1984	1706.1	335	98.7	78.4	98.7	78.4	58.0	74.6	8678	98.8
1985	1470.5	335	91.6	79.6	91.6	79.6	50.1	72.5	7159	81.7
1986	2205.0	335	75.8	79.3	75.8	79.3	75.1	72.7	7532	86.0
1987	1405.8	335	49.2	77.1	49.2	77.0	47.9	70.8	4391	50.1
1988	808.1	335	27.1	73.6	27.1	73.6	27.5	67.8	2515	28.6
1989	0.0	335	0.0	68.9	0.0	68.8	0.0	63.5	0	0.0
1990	1722.6	335	84.9	69.8	58.7	68.2	58.7	63.2	7201	82.2
1991	2721.9	335	92.6	71.1	92.6	69.6	92.8	64.9	8390	95.8
1992	2230.2	335	76.3	71.4	76.3	70.0	75.8	65.5	7089	80.7
1993	2403.7	335	82.2	72.0	82.2	70.6	81.9	66.3	7287	83.2
1994	2651.9	335	90.4	72.9	90.4	71.6	90.4	67.5	7916	90.4
1995	2671.7	335	92.3	73.8	92.3	72.5	91.0	68.6	8376	95.6
1996	2038.8	335	70.6	73.6	70.6	72.4	69.3	68.6	6990	79.6
1997	2720.1	335	93.4	74.5	93.4	73.3	92.7	69.6	8329	95.1

1998	2374.4	335	81.4	74.7	81.3	73.7	80.9	70.1	7242	82.7
1999	1395.5	335	47.8	73.7	47.8	72.6	47.6	69.2	4364	49.8
2000	1677.9	335	72.8	73.7	56.8	72.0	57.0	68.7	5038	57.4
2001	1426.0	335	48.7	72.8	48.7	71.2	48.6	68.0	4407	50.3
2002	1011.5	335	34.6	71.4	34.6	69.9	34.5	66.8	3030	34.6
2003	2020.6	335	68.8	71.3	68.8	69.9	68.9	66.9	6094	69.6
2004	2725.0	335	92.2	72.0	92.2	70.6	92.6	67.7	8250	93.9
2005	1998.0	335	68.5	71.9	68.5	70.5	68.1	67.8	7004	80.0
2006	2100.5	335	72.1	71.9	72.1	70.6	71.6	67.9	6403	73.1
2007	2718.7	335	94.0	72.6	93.8	71.3	92.6	68.6	8300	94.7
2008	2481.3	335	85.3	72.9	85.3	71.7	84.3	69.1	7562	86.1
2009	2397.2	335	82.9	73.2	82.9	72.0	81.7	69.4	7296	83.3
2010	2782.7	335	95.5	73.8	95.5	72.6	94.8	70.1	8560	97.7
2011	2334.5	335	80.3	74.0	79.6	72.8	79.5	70.4	7289	83.2
2012	2477.4	335	84.1	74.3	84.1	73.1	84.2	70.7	7521	85.6
2013	2449.5	335	83.1	74.5	82.4	73.4	83.5	71.1	7310	83.4
2014	2631.7	335	89.1	74.8	88.6	73.7	89.7	71.5	7875	89.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		165			688	
C. Inspection, maintenance or repair combined with refuelling				33		
D. Inspection, maintenance or repair without refuelling	720			1091	12	
E. Testing of plant systems or components				10		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				34		
H. Nuclear regulatory requirements					72	
J. Grid limitation, failure or grid unavailability						18
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						24
L. Human factor related					10	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						2
Subtotal	720	165	0	1168	782	44
Total		885			1994	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		108
12. Reactor I&C Systems	165	43
13. Reactor Auxiliary Systems		146
14. Safety Systems		32
15. Reactor Cooling Systems		165
16. Steam generation systems		52
17. Safety I&C Systems (excluding reactor I&C)		10
21. Fuel Handling and Storage Facilities		17
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		23
33. Circulating Water System		7
41. Main Generator Systems		6
42. Electrical Power Supply Systems		61
Total	165	681

## AR-2 EMBALSE

**Operator:** NASA (NUCLEOELECTRICA ARGENTINA S.A.)

**Contractor:** AECL (ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 600.0 MW(e)  
**Design Net Capacity:** 600.0 MW(e)  
**Design Discharge Burnup:** 7190 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1533.1 GW(e)·h  
**Energy Availability Factor:** 99.8%  
**Load Factor:** 29.2%  
**Operating Factor:** 42.0%  
**Energy Unavailability Factor:** 0.2%  
**Total Off-line Time:** 5082 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	349.2	293.8	47.8	0.0	111.6	294.0	307.5	129.2	0.0	0.0	0.0	0.0	1533.1
<b>EAF (%)</b>	98.5	99.8	100.0	100.0	99.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8
<b>UCF (%)</b>	98.5	99.8	100.0	100.0	99.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8
<b>LF (%)</b>	78.2	72.9	10.7	0.0	25.0	68.1	68.9	28.9	0.0	0.0	0.0	0.0	29.2
<b>OF (%)</b>	100.0	100.0	16.1	0.0	49.1	100.0	100.0	42.1	0.0	0.0	0.0	0.0	42.0
<b>EUf (%)</b>	1.5	0.2	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
<b>UCLF (%)</b>	1.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

AT THE BEGINNING OF THE YEAR 2014 THE PLANT HAD A LIMITED AMOUNT OF HOURS OF OPERATION LEFT UNTIL ITS END OF LIFE. THE GRID OPERATOR STARTED TO MANAGE THAT LIMITED GENERATION TIME IN SUCH A WAY THAT THEY BEGAN REQUESTING TO EMBALSE NPP TO GENERATE POWER DURING THE SEASONAL PEAKS DEMAND. THAT SITUATION CONTINUES UP TO THE PRESENT.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1974  
**Date of First Criticality:** 13 Mar 1983  
**Date of Grid Connection:** 25 Apr 1983  
**Date of Commercial Operation:** 20 Jan 1984

**Lifetime Generation:** 132984.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 85.3%  
**Cumulative Load Factor:** 80.8%  
**Cumulative Unit Capability Factor:** 85.6%  
**Cumulative Energy Unavailability Factor:** 14.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	2527.1	600	70.3	70.3	69.9	69.9	47.9	47.9	6355	72.3
1985	3778.6	600	93.4	81.9	93.4	81.6	71.9	59.9	8170	93.3
1986	3061.7	600	67.1	77.0	66.3	76.5	58.3	59.4	5847	66.7
1987	4577.0	600	87.9	79.7	87.9	79.4	87.1	66.3	7951	90.8
1988	4560.6	600	88.8	81.5	88.8	81.3	86.5	70.3	7798	88.8
1989	4659.0	600	90.1	82.9	89.1	82.6	88.6	73.4	7804	89.1
1990	5000.7	600	96.5	84.9	95.1	84.4	95.1	76.5	8404	95.9
1991	4498.8	600	89.7	85.5	85.8	84.5	85.6	77.6	7855	89.7
1992	4354.0	600	83.4	85.2	81.6	84.2	82.6	78.2	7440	84.7
1993	4773.3	600	90.7	85.8	90.6	84.8	90.8	79.4	7956	90.8
1994	5157.9	600	98.3	86.9	97.8	86.0	98.1	81.1	8575	97.9
1995	3897.9	600	74.3	85.9	74.3	85.1	74.2	80.6	6541	74.7
1996	4892.0	600	92.8	86.4	92.8	85.6	92.8	81.5	8176	93.1
1997	4737.0	600	89.3	86.6	89.3	85.9	90.1	82.1	7821	89.3
1998	4555.4	600	86.9	86.6	86.9	86.0	86.7	82.4	7629	87.1
1999	5201.8	598	99.1	87.4	99.1	86.8	99.3	83.5	8700	99.3
2000	4064.5	643	78.2	86.8	78.1	86.2	72.0	82.8	6837	77.8
2001	5128.1	600	97.5	87.4	97.4	86.9	97.6	83.6	8564	97.8
2002	4385.5	600	84.0	87.2	83.4	86.7	83.4	83.6	7401	84.5
2003	5004.1	600	95.1	87.6	95.1	87.1	95.2	84.1	8367	95.5

2004	4589.6	600	87.5	87.6	87.5	87.1	87.1	84.3	7704	87.7
2005	4372.5	600	83.3	87.4	83.3	86.9	83.2	84.2	7341	83.8
2006	5052.1	600	96.2	87.8	96.2	87.3	96.1	84.7	8455	96.5
2007	4003.7	600	76.5	87.3	76.5	86.9	76.2	84.4	6771	77.3
2008	4368.6	600	82.9	87.2	82.9	86.7	82.9	84.3	7382	84.0
2009	5192.4	600	98.8	87.6	98.8	87.2	98.8	84.9	8705	99.4
2010	3908.7	600	74.9	87.1	74.4	86.7	74.4	84.5	6701	76.5
2011	3559.4	600	67.7	86.4	67.7	86.0	67.7	83.9	7405	84.5
2012	3425.5	600	65.1	85.7	65.1	85.3	65.0	83.2	7214	82.1
2013	3285.7	600	69.6	85.2	69.6	84.8	62.5	82.6	6841	78.1
2014	1533.1	600	99.8	85.6	99.8	85.3	29.2	80.8	3678	42.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					237	
C. Inspection, maintenance or repair combined with refuelling				109		
D. Inspection, maintenance or repair without refuelling				749		
E. Testing of plant systems or components				44	1	
H. Nuclear regulatory requirements					1	
J. Grid limitation, failure or grid unavailability						16
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						19
L. Human factor related					1	
M. Governmental requirements or court decisions			5082			
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other					2	
Subtotal	0	0	5082	902	242	36
Total		5082			1180	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		34
15. Reactor Cooling Systems		12
16. Steam generation systems		67
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		21
33. Circulating Water System		1
41. Main Generator Systems		44
42. Electrical Power Supply Systems		7
XX. Miscellaneous Systems		2
Total	0	231

## AM-19 ARMENIAN-2

**Operator:** ANPPCJSC (Closed Joint Stock Company Armenian NPP)

**Contractor:** FAEA (Federal Atomic Energy Agency)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP at the beginning of 2014):** 375.0 MW(e)  
**Design Net Capacity:** 375.0 MW(e)  
**Design Discharge Burnup:** 28600 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 2265.6 GW(e)·h  
**Energy Availability Factor:** 67.3%  
**Load Factor:** 69.0%  
**Operating Factor:** 86.1%  
**Energy Unavailability Factor:** 32.7%  
**Total Off-line Time:** 1218 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	143.5	184.2	247.9	231.9	197.6	232.6	235.6	232.5	198.5	0.0	98.6	262.7	2265.6
<b>EAF (%)</b>	48.2	69.5	87.4	83.3	67.1	85.6	83.7	82.7	72.8	0.0	36.7	91.3	67.3
<b>UCF (%)</b>	48.2	69.5	88.9	87.8	71.7	91.5	91.2	90.8	78.9	0.0	36.7	91.3	70.5
<b>LF (%)</b>	51.4	73.1	88.9	85.9	70.8	86.1	84.5	83.3	73.5	0.0	36.5	94.1	69.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	86.7	0.0	47.5	100.0	86.1
<b>EUf (%)</b>	51.8	30.5	12.6	16.7	32.9	14.4	16.3	17.3	27.2	100.0	63.3	8.7	32.7
<b>PUf (%)</b>	49.0	25.6	8.0	8.0	24.9	8.0	8.0	8.0	20.3	100.0	50.7	8.0	26.6
<b>UCLF (%)</b>	2.9	4.9	3.1	4.2	3.4	0.5	0.8	1.2	0.8	0.0	12.7	0.7	2.9
<b>XUF (%)</b>	0.0	0.0	1.4	4.5	4.6	5.9	7.5	8.1	6.1	0.0	0.0	0.0	3.2

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ON 26 OF SEPTEMBER, 2014, UNIT 2 OF THE ARMENIAN NPP WAS TAKING OUT FOR 2013 PLANNED OUTAGE FOR PREVENTIVE MAINTENANCE. ON 8 OF NOVEMBER, 2014, UNIT 2 OF THE ARMENIAN NPP WAS PUT INTO OPERATION; IN 2013, DURING THE OPERATION OF UNIT 2 OF THE ARMENIAN NPP, 5 EVENT OF 0; DURING THE PLANNED 2014 OUTAGE, A NUMBER OF MEASURES FROM THE ADOPTED LIST OF MEASURES FOR UNIT 2 OF THE ANPP SAFETY UPGRADING HAVE BEEN IMPLEMENTED;

### 5. Historical Summary

**Date of Construction Start:** 01 Jul 1975  
**Date of First Criticality:** 01 Jan 1980  
**Date of Grid Connection:** 05 Jan 1980  
**Date of Commercial Operation:** 03 May 1980

**Lifetime Generation:** 62303.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 65.6%  
**Cumulative Load Factor:** 64.5%  
**Cumulative Unit Capability Factor:** 67.6%  
**Cumulative Energy Unavailability Factor:** 34.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	Data not provided									
1981	"									
1982	"									
1983	"									
1984	"									
1985	"									
1986	"									
1987	2629.1	408	79.3	79.3	79.3	79.3	73.6	73.6	7040	80.4
1988	2254.5	376	73.4	76.5	73.4	76.5	68.3	71.0	6741	76.7
1989	671.3	376	99.6	78.9	99.6	78.9	82.7	72.2	1838	85.1
1990	Data not available - Long-term shutdown									
1991	"									
1992	"									
1993	"									
1994	"									
1995	Data not provided									
1996	2098.0	376	86.2	81.1	63.6	74.3	63.5	69.6	7561	86.1
1997	1430.0	376	43.4	72.4	43.4	67.2	43.4	63.6	5700	65.1
1998	1416.5	376	44.6	67.2	44.6	63.0	43.0	59.7	6408	73.2

1999	1890.4	376	57.4	65.7	57.4	62.1	57.4	59.4	6193	70.7
2000	1841.5	376	55.8	64.3	55.8	61.2	55.8	58.9	5699	64.9
2001	1815.4	376	55.1	63.2	55.1	60.5	55.1	58.4	5660	64.6
2002	2078.9	376	63.3	63.2	63.2	60.8	63.1	58.9	6961	79.5
2003	1997.6	376	63.4	63.2	60.6	60.8	60.6	59.1	6120	69.9
2004	2196.6	376	70.3	63.9	64.2	61.1	66.5	59.7	7135	81.2
2005	2504.5	376	76.3	64.9	76.3	62.3	76.0	61.1	7658	87.4
2006	2421.6	376	76.1	65.7	76.1	63.3	73.5	62.0	7632	87.1
2007	2347.8	376	73.8	66.3	73.8	64.1	71.3	62.6	7447	85.0
2008	2265.9	376	69.0	66.5	69.0	64.4	68.6	63.0	7013	79.8
2009	2290.4	375	71.3	66.7	69.9	64.7	69.7	63.4	7408	84.6
2010	2286.5	375	71.8	67.0	69.7	65.0	69.6	63.8	7535	86.0
2011	2356.8	375	75.5	67.5	73.7	65.5	71.7	64.2	7552	86.2
2012	2123.5	375	68.3	67.5	66.4	65.5	64.5	64.2	7052	80.3
2013	2167.6	375	66.4	67.5	64.4	65.5	66.0	64.3	7237	82.6
2014	2265.6	375	70.5	67.6	67.3	65.6	69.0	64.5	7542	86.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		193			76	
C. Inspection, maintenance or repair combined with refuelling	1025			1050		
D. Inspection, maintenance or repair without refuelling				78		
E. Testing of plant systems or components					2	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				56		
J. Grid limitation, failure or grid unavailability						9
L. Human factor related					1	
Subtotal	1025	193	0	1184	79	9
Total		1218			1272	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	193	8
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems		8
15. Reactor Cooling Systems		7
16. Steam generation systems		7
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		1
41. Main Generator Systems		1
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		24
Total	193	71



## BE-2 DOEL-1

Operator: ELECTRAB (Electrabel)

Contractor: ACECOWEN (ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE ))

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 433.0 MW(e)  
 Design Net Capacity: 392.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3556.4 GW(e)·h  
 Energy Availability Factor: 93.4%  
 Load Factor: 93.8%  
 Operating Factor: 93.9%  
 Energy Unavailability Factor: 6.6%  
 Total Off-line Time: 530 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	134.7	283.2	325.9	314.3	322.1	264.3	321.2	319.7	312.0	322.2	313.7	323.2	3556.4
EAF (%)	41.5	96.3	100.0	100.0	100.0	84.6	99.8	99.5	100.0	99.6	100.0	99.6	93.4
UCF (%)	43.5	96.3	100.0	100.0	100.0	84.7	100.0	100.0	100.0	99.8	100.0	100.0	93.6
LF (%)	41.8	97.3	101.3	100.8	100.0	84.8	99.7	99.2	100.1	99.9	100.6	100.3	93.8
OF (%)	46.0	96.9	100.0	100.0	100.0	85.1	100.0	100.0	100.0	100.0	100.0	100.0	93.9
EUf (%)	58.5	3.7	0.0	0.0	0.0	15.4	0.2	0.5	0.0	0.4	0.0	0.4	6.6
PUf (%)	56.5	0.0	0.0	0.0	0.0	15.3	0.0	0.0	0.0	0.0	0.0	0.0	6.1
UCLF (%)	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.3
XUF (%)	2.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.0	0.1	0.0	0.4	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

=&gt; 04-01-2014 TO 20-01-2014 : REFUELING OUTAGE=&gt; 13-02-2014 TO 14-02-2014 : SCRAM=&gt;

20-06-2014 TO 25-06-2014 : SHUTDOWN FOR PERIODIC TESTS ON SI SYSTEM

### 5. Historical Summary

Date of Construction Start: 01 Jul 1969      Lifetime Generation: 120864.8 GW(e)·h  
 Date of First Criticality: 18 Jul 1974      Cumulative Energy Availability Factor: 86.0%  
 Date of Grid Connection: 28 Aug 1974      Cumulative Load Factor: 86.3%  
 Date of Commercial Operation: 15 Feb 1975      Cumulative Unit Capability Factor: 86.8%  
    Cumulative Energy Unavailability Factor: 14.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	2407.2	392	76.6	76.6	76.6	76.6	76.6	76.6	6672	83.2
1976	2667.1	395	75.5	76.0	75.5	76.0	76.9	76.7	6928	78.9
1977	2830.0	395	81.8	78.0	81.8	78.0	81.8	78.5	7332	83.7
1978	2731.2	395	78.9	78.2	78.9	78.2	78.9	78.6	7071	80.7
1979	3037.0	395	86.4	79.9	86.4	79.9	87.8	80.5	7812	89.2
1980	2901.0	395	84.4	80.6	84.4	80.6	83.6	81.0	7596	86.5
1981	2946.0	395	85.0	81.3	85.0	81.3	85.1	81.6	7644	87.3
1982	3184.5	395	91.2	82.5	91.2	82.5	92.0	82.9	8103	92.5
1983	2823.0	393	81.8	82.4	81.8	82.4	82.0	82.8	7316	83.5
1984	3129.0	393	90.2	83.2	90.2	83.2	90.6	83.6	7988	90.9
1985	2896.3	392	82.4	83.2	82.4	83.2	84.3	83.7	7330	83.7
1986	2685.9	392	79.1	82.8	78.8	82.8	78.2	83.2	7040	80.4
1987	2928.4	400	85.5	83.0	85.4	83.0	83.6	83.2	7306	83.4
1988	2694.1	400	86.6	83.3	81.3	82.9	76.7	82.8	7686	87.5
1989	2513.1	400	73.6	82.6	71.9	82.1	71.7	82.0	6475	73.9
1990	2859.9	400	85.6	82.8	83.5	82.2	81.6	82.0	7380	84.2
1991	3061.4	400	89.5	83.2	89.2	82.6	87.4	82.3	7860	89.7
1992	2990.5	400	87.7	83.5	86.5	82.9	85.1	82.5	7741	88.1
1993	2908.9	400	86.0	83.6	84.4	82.9	83.0	82.5	7580	86.5
1994	2921.8	400	88.7	83.9	84.3	83.0	83.4	82.5	7635	87.2
1995	2791.5	392	82.7	83.8	81.0	82.9	81.3	82.5	7342	83.8
1996	3169.4	392	91.5	84.2	91.3	83.3	92.0	82.9	8141	92.7

1997	3113.8	392	89.0	84.4	88.9	83.5	90.7	83.3	7899	90.2
1998	3292.5	392	94.1	84.8	93.7	84.0	95.9	83.8	8277	94.5
1999	3196.8	392	92.6	85.1	91.1	84.2	93.1	84.1	8123	92.7
2000	3264.8	392	94.2	85.4	92.3	84.6	94.8	84.6	8317	94.7
2001	3157.6	392	91.4	85.6	90.5	84.8	91.9	84.8	8098	92.4
2002	3260.7	392	93.4	85.9	93.3	85.1	95.0	85.2	8308	94.8
2003	3024.6	392	90.3	86.1	86.4	85.1	88.1	85.3	7953	90.8
2004	2989.1	392	87.6	86.1	85.5	85.1	86.8	85.3	7742	88.1
2005	3062.6	392	89.1	86.2	88.0	85.2	89.2	85.5	7849	89.6
2006	3100.5	392	91.1	86.4	89.2	85.3	90.3	85.6	8030	91.7
2007	3029.0	392	87.7	86.4	87.6	85.4	88.2	85.7	7709	88.0
2008	2690.3	392	77.3	86.1	77.3	85.2	78.1	85.5	6847	77.9
2009	2874.1	392	82.9	86.1	82.9	85.1	83.7	85.4	7266	82.9
2010	3401.4	433	88.3	86.1	88.2	85.2	89.7	85.5	7801	89.1
2011	3328.5	433	87.9	86.2	87.8	85.3	87.8	85.6	7740	88.4
2012	3444.7	433	90.9	86.3	90.9	85.4	90.6	85.8	8019	91.3
2013	3707.9	433	97.9	86.6	97.2	85.8	97.8	86.1	8595	98.1
2014	3556.4	433	93.6	86.8	93.4	86.0	93.8	86.3	8230	93.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		21			191	
C. Inspection, maintenance or repair combined with refuelling	401			764		
D. Inspection, maintenance or repair without refuelling				6		
E. Testing of plant systems or components	107			49	1	
H. Nuclear regulatory requirements					5	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						5
L. Human factor related					12	
P. Fire					0	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				20	38	
Z. Other					1	
Subtotal	508	21	0	839	248	5
Total	529			1092		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems	21	10
13. Reactor Auxiliary Systems		1
14. Safety Systems		8
15. Reactor Cooling Systems		33
16. Steam generation systems		35
31. Turbine and auxiliaries		67
32. Feedwater and Main Steam System		18
33. Circulating Water System		0
41. Main Generator Systems		6
42. Electrical Power Supply Systems		0
Total	21	186

## BE-4 DOEL-2

Operator: ELECTRAB (Electrabel)

Contractor: ACECOWEN (ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE ))

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 433.0 MW(e)  
 Design Net Capacity: 392.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3528.4 GW(e)·h  
 Energy Availability Factor: 92.7%  
 Load Factor: 93.0%  
 Operating Factor: 94.6%  
 Energy Unavailability Factor: 7.3%  
 Total Off-line Time: 469 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	322.7	294.3	325.8	313.6	296.9	102.2	303.5	319.6	311.3	301.5	313.4	323.8	3528.4
EAF (%)	100.0	100.0	100.0	99.9	92.2	32.8	94.3	99.2	99.9	93.3	100.0	100.0	92.7
UCF (%)	100.0	100.0	100.0	100.0	100.0	43.3	95.0	100.0	100.0	93.4	100.0	100.0	94.3
LF (%)	100.2	101.1	101.3	100.6	92.2	32.8	94.2	99.2	99.8	93.5	100.5	100.5	93.0
OF (%)	100.0	100.0	100.0	100.0	100.0	43.5	97.3	100.0	100.0	94.4	100.0	100.0	94.6
EUf (%)	0.0	0.0	0.0	0.1	7.8	67.2	5.7	0.8	0.1	6.7	0.0	0.0	7.3
PUf (%)	0.0	0.0	0.0	0.0	0.0	56.7	5.0	0.0	0.0	0.0	0.0	0.0	5.1
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.6
XUF (%)	0.0	0.0	0.0	0.0	7.8	10.5	0.7	0.8	0.1	0.1	0.0	0.0	1.7

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

=> 14-06-2014 TO 01-07-2014: REFUELING OUTAGE=> 24-10-2014 TO 26-10-2014 : SHUTDOWN TO REPAIR A SAFETY VALVE SI-ACCU=> 26-10-2014 08H02 : SCRAM MANUAL AT 0% POWER, REACTOR CRITICAL

### 5. Historical Summary

Date of Construction Start: 01 Sep 1971      Lifetime Generation: 116183.8 GW(e)·h  
 Date of First Criticality: 04 Aug 1975      Cumulative Energy Availability Factor: 83.0%  
 Date of Grid Connection: 21 Aug 1975      Cumulative Load Factor: 83.4%  
 Date of Commercial Operation: 01 Dec 1975      Cumulative Unit Capability Factor: 83.8%  
    Cumulative Energy Unavailability Factor: 17.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	266.4	392	91.3	91.3	91.3	91.3	91.3	91.3	694	93.3
1976	2462.8	395	71.6	73.2	71.6	73.2	71.0	72.6	6519	74.2
1977	2576.8	395	74.3	73.7	74.3	73.7	74.5	73.5	6649	75.9
1978	2750.6	395	79.5	75.6	79.5	75.6	79.5	75.4	7114	81.2
1979	2593.3	395	74.6	75.3	74.6	75.3	74.9	75.3	6639	75.8
1980	2782.0	395	79.7	76.2	79.7	76.2	80.2	76.3	7111	81.0
1981	2841.7	395	81.4	77.1	81.4	77.1	82.1	77.2	7226	82.5
1982	2582.0	395	73.8	76.6	73.8	76.6	74.6	76.9	6598	75.3
1983	2017.0	393	58.0	74.3	58.0	74.3	58.6	74.6	5190	59.2
1984	2916.0	393	84.1	75.4	84.1	75.4	84.5	75.7	7508	85.5
1985	2908.7	392	83.0	76.1	83.0	76.1	84.7	76.6	7341	83.8
1986	2282.6	392	69.8	75.6	69.8	75.6	66.5	75.7	5891	67.2
1987	2616.4	400	77.8	75.8	76.8	75.7	74.7	75.6	6612	75.5
1988	2906.7	400	83.2	76.3	82.6	76.2	82.7	76.1	7408	84.3
1989	2479.8	400	71.8	76.0	70.8	75.8	70.8	75.8	6436	73.5
1990	1982.6	400	66.5	75.4	56.6	74.5	56.6	74.5	5170	59.0
1991	2779.8	400	81.2	75.7	81.0	74.9	79.3	74.8	7136	81.5
1992	2971.9	400	86.3	76.4	86.1	75.6	84.6	75.4	7617	86.7
1993	2949.5	400	85.9	76.9	85.7	76.2	84.2	75.9	7551	86.2
1994	2982.4	392	87.3	77.4	86.2	76.7	86.9	76.4	7810	89.2
1995	2867.5	392	82.9	77.7	82.7	77.0	83.5	76.8	7342	83.8
1996	2888.8	392	83.4	78.0	83.1	77.3	83.9	77.1	7390	84.1

1997	2935.0	392	87.7	78.4	84.5	77.6	85.5	77.5	7749	88.5
1998	3145.0	392	90.2	78.9	90.1	78.1	91.6	78.1	7987	91.2
1999	3091.7	392	89.6	79.4	88.9	78.6	90.0	78.6	7875	89.9
2000	3135.6	392	90.4	79.8	89.8	79.0	91.1	79.1	8022	91.3
2001	3150.5	392	90.9	80.2	90.3	79.4	91.7	79.6	8060	92.0
2002	3104.5	392	91.4	80.6	89.5	79.8	90.4	80.0	8076	92.2
2003	3142.6	392	93.1	81.1	90.1	80.2	91.5	80.4	8184	93.4
2004	2951.9	413	81.9	81.1	80.5	80.2	81.3	80.4	7174	81.7
2005	3506.7	433	91.3	81.5	90.8	80.6	92.4	80.8	8036	91.7
2006	3399.3	433	90.1	81.8	88.2	80.8	89.6	81.1	7954	90.8
2007	3483.1	433	90.8	82.1	90.8	81.2	91.8	81.5	7985	91.2
2008	3478.9	433	90.3	82.3	90.3	81.5	91.5	81.8	8000	91.1
2009	3468.5	433	90.1	82.6	90.1	81.7	91.4	82.1	7941	90.7
2010	3411.4	433	88.4	82.8	88.3	81.9	89.9	82.4	7823	89.3
2011	3570.9	433	94.1	83.1	94.1	82.3	94.1	82.7	8292	94.7
2012	3261.6	433	86.1	83.2	86.1	82.4	85.8	82.8	7605	86.6
2013	3566.8	433	93.8	83.5	93.5	82.7	94.0	83.1	8238	94.0
2014	3528.4	433	94.3	83.8	92.7	83.0	93.0	83.4	8291	94.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		42			268	
C. Inspection, maintenance or repair combined with refuelling	426			797		
D. Inspection, maintenance or repair without refuelling				135		
E. Testing of plant systems or components				74	11	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						18
L. Human factor related					15	
P. Fire					0	
Z. Other					8	
Subtotal	426	42	0	1006	302	18
Total		468			1326	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		7
14. Safety Systems	42	7
15. Reactor Cooling Systems		21
16. Steam generation systems		75
21. Fuel Handling and Storage Facilities		23
31. Turbine and auxiliaries		75
32. Feedwater and Main Steam System		15
41. Main Generator Systems		10
42. Electrical Power Supply Systems		7
XX. Miscellaneous Systems		10
Total	42	262

## BE-5 DOEL-3

Operator: ELECTRAB (Electrabel)

Contractor: FRAMACEC (FRAMACECO ( FRAMATOME-ACEC-COCKERILL ))

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1006.0 MW(e)

Design Net Capacity: 890.0 MW(e)

Design Discharge Burnup: 49000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 2072.3 GW(e)·h

Energy Availability Factor: 23.2%

Load Factor: 23.5%

Operating Factor: 23.2%

Energy Unavailability Factor: 76.8%

Total Off-line Time: 6730 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	760.6	686.3	625.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2072.3
EAF (%)	100.0	100.0	82.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.2
UCF (%)	100.0	100.0	82.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.2
LF (%)	101.6	101.5	83.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.5
OF (%)	100.0	100.0	82.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.2
EUf (%)	0.0	0.0	17.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	76.8
PUf (%)	0.0	0.0	0.0	16.7	100.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5
UCLF (%)	0.0	0.0	17.5	83.3	0.0	80.0	100.0	100.0	100.0	100.0	100.0	100.0	65.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

=&gt; 26-03 TO 25-04 : UNPLANNED SHUTDOWN FOR TESTS ON REACTORVESSEL=&gt; 26-04 TO 06-06 :

CONTINUATION PLANNED REFUELING OUTAGE=&gt; 07-06 TO END YEAR : CONTINUATION UNPLANNED SHUTDOWN FOR TESTS ON REACTORVESSEL

### 5. Historical Summary

Date of Construction Start: 01 Jan 1975      Lifetime Generation: 224063.3 GW(e)·h

Date of First Criticality: 14 Jun 1982      Cumulative Energy Availability Factor: 81.8%

Date of Grid Connection: 23 Jun 1982      Cumulative Load Factor: 81.7%

Date of Commercial Operation: 01 Oct 1982      Cumulative Unit Capability Factor: 83.0%

   Cumulative Energy Unavailability Factor: 18.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1982	1764.0	944	88.8	88.8	88.8	88.8	88.8	88.8	2033	92.1
1983	6705.0	900	85.0	85.8	85.0	85.8	85.0	85.8	7807	89.1
1984	7074.0	900	89.5	87.5	89.5	87.5	89.5	87.4	8084	92.0
1985	6496.3	900	82.4	85.9	82.4	85.9	82.4	85.9	7515	85.8
1986	6860.0	897	88.5	86.5	88.5	86.5	87.3	86.2	8007	91.4
1987	5713.2	897	75.7	84.4	73.5	84.0	72.7	83.7	6905	78.8
1988	6777.5	890	88.7	85.1	85.9	84.3	86.7	84.1	7875	89.7
1989	5774.9	900	82.1	84.7	73.4	82.8	73.2	82.6	7470	85.3
1990	6811.8	900	89.9	85.3	86.4	83.3	86.4	83.1	8021	91.6
1991	6742.9	900	90.0	85.8	85.8	83.5	85.5	83.4	7913	90.3
1992	6732.2	900	92.3	86.5	90.1	84.2	85.2	83.5	7778	88.5
1993	5377.2	900	69.6	85.0	65.8	82.5	68.2	82.2	6198	70.8
1994	7482.3	970	88.4	85.3	87.7	83.0	88.1	82.7	7888	90.0
1995	7025.1	970	83.4	85.1	82.6	83.0	82.7	82.7	7396	84.4
1996	7334.2	993	84.4	85.1	83.8	83.0	84.0	82.8	7447	84.8
1997	8108.2	1006	93.5	85.7	91.9	83.7	92.0	83.4	8250	94.2
1998	8012.6	1006	92.0	86.1	90.9	84.2	90.9	83.9	8171	93.3
1999	8231.2	1006	94.8	86.6	93.4	84.7	93.4	84.5	8330	95.1
2000	7884.9	1006	89.3	86.8	89.0	85.0	89.2	84.8	7892	89.8
2001	7993.3	1006	90.9	87.0	90.2	85.3	90.7	85.1	7989	91.2
2002	7636.6	1006	86.7	87.0	86.2	85.3	86.7	85.2	7647	87.3

2003	7870.8	1006	89.8	87.1	89.7	85.5	89.3	85.4	7928	90.5
2004	7984.8	1006	91.6	87.4	90.8	85.8	90.4	85.7	8104	92.3
2005	7962.7	1006	92.4	87.6	91.1	86.0	90.4	85.9	8147	93.0
2006	7708.7	1006	88.2	87.6	87.3	86.1	87.5	85.9	7764	88.6
2007	7697.1	1006	87.2	87.6	87.1	86.1	87.3	86.0	7710	88.0
2008	6943.5	1006	78.5	87.2	78.5	85.8	78.6	85.7	6980	79.5
2009	7987.1	1006	90.4	87.4	90.4	86.0	90.6	85.9	7947	90.7
2010	7817.2	1006	89.3	87.4	88.2	86.1	88.7	86.0	7862	89.7
2011	7911.7	1006	90.2	87.5	90.0	86.2	89.8	86.1	7933	90.6
2012	3695.3	1006	41.7	85.9	41.7	84.7	41.8	84.6	3668	41.8
2013	4998.2	1006	56.9	85.0	56.9	83.8	56.7	83.7	5023	57.3
2014	2072.3	1006	23.2	83.0	23.2	81.8	23.5	81.7	2030	23.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		5721			167	
C. Inspection, maintenance or repair combined with refuelling	1008			702	1	
D. Inspection, maintenance or repair without refuelling				6		
E. Testing of plant systems or components				0	0	
H. Nuclear regulatory requirements					240	
L. Human factor related					16	
P. Fire					0	
Z. Other					8	
Subtotal	1008	5721	0	708	432	0
Total		6729			1140	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	5721	12
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		1
14. Safety Systems		0
15. Reactor Cooling Systems		55
16. Steam generation systems		42
17. Safety I&C Systems (excluding reactor I&C)		14
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System		12
41. Main Generator Systems		5
42. Electrical Power Supply Systems		4
Total	5721	162

**BE-7 DOEL-4****Operator:** ELECTRAB (Electrabel)**Contractor:** ACECOWEN (ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE ))**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1039.0 MW(e)

**Design Net Capacity:** 1000.0 MW(e)

**Design Discharge Burnup:** 45000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 4887.0 GW(e)·h

**Energy Availability Factor:** 53.7%

**Load Factor:** 53.7%

**Operating Factor:** 54.7%

**Energy Unavailability Factor:** 46.3%

**Total Off-line Time:** 3964 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	771.5	696.9	342.6	416.2	766.3	736.9	751.2	108.0	0.0	0.0	0.0	297.3	4887.0
<b>EAF (%)</b>	99.9	99.9	44.4	55.7	99.2	98.5	97.2	14.0	0.0	0.0	0.0	38.5	53.7
<b>UCF (%)</b>	99.9	99.9	44.4	56.0	100.0	100.0	99.8	14.4	0.0	0.0	0.0	38.5	54.2
<b>LF (%)</b>	99.8	99.8	44.4	55.6	99.1	98.5	97.2	14.0	0.0	0.0	0.0	38.5	53.7
<b>OF (%)</b>	100.0	100.0	44.8	60.1	100.0	100.0	100.0	14.4	0.0	0.0	0.0	40.2	54.7
<b>EUf (%)</b>	0.1	0.1	55.6	44.3	0.8	1.5	2.8	86.0	100.0	100.0	100.0	61.5	46.3
<b>PUf (%)</b>	0.0	0.0	55.5	43.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3
<b>UCLF (%)</b>	0.1	0.1	0.1	0.3	0.0	0.0	0.2	85.6	100.0	100.0	100.0	61.5	37.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.3	0.8	1.5	2.6	0.4	0.0	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

=> 14-03 TO 12-04 : REFUELING OUTAGE=> 05-08 TO 19-12 : SHUTDOWN TRIP TURBINE AND SCRAM DUE TO LOSS OF OIL TURBINE

**5. Historical Summary**

**Date of Construction Start:** 01 Dec 1978 **Lifetime Generation:** 216471.6 GW(e)·h

**Date of First Criticality:** 31 Mar 1985 **Cumulative Energy Availability Factor:** 83.2%

**Date of Grid Connection:** 08 Apr 1985 **Cumulative Load Factor:** 83.0%

**Date of Commercial Operation:** 01 Jul 1985 **Cumulative Unit Capability Factor:** 83.9%

**Cumulative Energy Unavailability Factor:** 16.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	3574.9	981	82.6	82.6	82.6	82.6	82.6	82.6	3884	87.9
1986	7722.9	1006	87.8	86.1	87.8	86.1	87.6	86.0	7973	91.0
1987	6809.3	1006	81.4	84.2	77.0	82.4	77.3	82.5	7448	85.0
1988	7552.0	1000	87.6	85.2	85.9	83.4	86.0	83.5	7784	88.6
1989	7445.9	1010	87.4	85.7	84.4	83.7	84.2	83.6	7737	88.3
1990	7535.8	1010	88.2	86.1	85.3	83.9	85.2	83.9	7790	88.9
1991	7425.4	1010	84.8	85.9	84.1	84.0	83.9	83.9	7673	87.6
1992	7418.6	1010	86.7	86.0	85.9	84.2	83.6	83.9	7481	85.2
1993	6980.9	1010	79.6	85.3	78.9	83.6	78.9	83.3	7112	81.2
1994	3462.7	1001	39.2	80.4	39.2	78.9	39.5	78.7	3637	41.5
1995	6769.7	1001	76.9	80.1	76.8	78.7	77.2	78.6	7381	84.3
1996	6186.8	1001	70.6	79.3	69.9	78.0	70.4	77.8	6565	74.7
1997	7548.7	1001	87.1	79.9	87.0	78.7	86.1	78.5	7653	87.4
1998	7844.0	985	90.0	80.6	90.0	79.5	90.9	79.4	7998	91.3
1999	8008.4	985	92.5	81.4	92.4	80.4	92.8	80.3	8150	93.0
2000	7992.9	985	92.0	82.1	92.0	81.1	92.4	81.1	8323	94.8
2001	8098.9	985	93.3	82.8	93.2	81.8	93.9	81.8	8264	94.3
2002	7831.9	985	90.6	83.2	90.4	82.3	90.8	82.3	8017	91.5
2003	7781.2	985	91.1	83.6	90.5	82.8	90.2	82.8	8015	91.5
2004	7519.8	985	88.4	83.9	87.0	83.0	86.9	83.0	7843	89.3
2005	7394.8	985	86.1	84.0	85.9	83.1	85.7	83.1	7647	87.3
2006	7462.0	1008	86.5	84.1	86.2	83.3	84.5	83.2	7633	87.1

2007	8496.9	1008	98.1	84.7	98.1	83.9	96.2	83.8	8608	98.3
2008	7466.7	1008	85.2	84.8	85.2	84.0	84.3	83.8	7534	85.8
2009	6911.0	1047	78.3	84.5	78.3	83.8	77.8	83.5	6946	79.3
2010	7395.4	1038	81.6	84.4	81.6	83.7	81.3	83.4	7192	82.1
2011	7978.5	1039	88.8	84.5	88.8	83.9	87.7	83.6	7832	89.4
2012	7818.7	1039	86.5	84.6	86.4	84.0	85.7	83.7	7659	87.2
2013	8447.5	1039	93.5	84.9	93.5	84.3	92.8	84.0	8192	93.5
2014	4887.0	1039	54.2	83.9	53.7	83.2	53.7	83.0	4796	54.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		3266			307	
C. Inspection, maintenance or repair combined with refuelling	697			747		
D. Inspection, maintenance or repair without refuelling				22		
E. Testing of plant systems or components				1	0	
H. Nuclear regulatory requirements					0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					27	
P. Fire					30	
Z. Other					39	
Subtotal	697	3266	0	770	403	0
Total		3963			1173	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		1
14. Safety Systems		4
15. Reactor Cooling Systems		19
16. Steam generation systems		166
31. Turbine and auxiliaries	3266	68
32. Feedwater and Main Steam System		15
33. Circulating Water System		0
41. Main Generator Systems		27
42. Electrical Power Supply Systems		2
Total	3266	302



**BE-3 TIHANGE-1****Operator:** ELECTRAB (Electrabel)**Contractor:** ACLF ((ACECOWEN - CREUSOT LOIRE - FRAMATOME))**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 962.0 MW(e)

**Design Net Capacity:** 870.0 MW(e)

**Design Discharge Burnup:** 45000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 7192.8 GW(e)·h

**Energy Availability Factor:** 84.5%

**Load Factor:** 85.4%

**Operating Factor:** 85.7%

**Energy Unavailability Factor:** 15.5%

**Total Off-line Time:** 1257 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	730.2	661.5	713.1	693.4	712.8	679.2	697.5	655.7	0.0	221.4	702.6	725.3	7192.8
<b>EAF (%)</b>	100.0	100.0	97.0	99.8	99.6	98.2	97.5	91.6	0.0	30.8	100.0	100.0	84.5
<b>UCF (%)</b>	100.0	100.0	97.0	100.0	100.0	99.9	100.0	93.4	0.0	30.8	100.0	100.0	85.1
<b>LF (%)</b>	102.0	102.3	99.8	100.1	99.6	98.1	97.4	91.6	0.0	30.9	101.4	101.3	85.4
<b>OF (%)</b>	100.0	100.0	97.6	100.0	100.0	100.0	100.0	94.0	0.0	36.4	100.0	100.0	85.7
<b>EUf (%)</b>	0.0	0.0	3.0	0.2	0.4	1.8	2.5	8.4	100.0	69.2	0.0	0.0	15.5
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	100.0	54.0	0.0	0.0	13.4
<b>UCLF (%)</b>	0.0	0.0	3.1	0.0	0.0	0.1	0.0	0.1	0.0	15.2	0.0	0.0	1.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.2	0.4	1.7	2.5	1.7	0.0	0.0	0.0	0.0	0.6

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

MARCH 2014 : SIGNING OF THE AGREEMENT ON LONG TERM OPERATION.2014-03-19 : AUTOMATIC SCRAM.2014-08-30 : PLANNED SHUTDOWN FOR INSPECTION, MAINTENANCE & REFUELLING.2014-10- 16 : OUTAGE EXTENSION.

**5. Historical Summary**

**Date of Construction Start:** 01 Jun 1970 **Lifetime Generation:** 264786.6 GW(e)·h

**Date of First Criticality:** 21 Feb 1975 **Cumulative Energy Availability Factor:** 83.7%

**Date of Grid Connection:** 07 Mar 1975 **Cumulative Load Factor:** 83.5%

**Date of Commercial Operation:** 01 Oct 1975 **Cumulative Unit Capability Factor:** 86.0%

**Cumulative Energy Unavailability Factor:** 16.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	1463.0	885	76.2	76.2	76.2	76.2	76.2	76.2	2087	94.5
1976	4409.5	870	89.8	87.0	57.5	61.3	57.7	61.4	6354	72.3
1977	5842.3	870	76.7	82.4	76.7	68.1	76.7	68.2	7234	82.6
1978	6371.0	870	84.3	83.0	84.3	73.1	83.6	72.9	7582	86.6
1979	5159.0	870	67.6	79.4	67.6	71.8	67.7	71.7	6121	69.9
1980	6173.0	870	80.7	79.6	80.7	73.5	80.8	73.4	7337	83.5
1981	6414.2	870	83.8	80.3	83.8	75.1	84.2	75.1	7762	88.6
1982	6164.8	870	80.8	80.4	80.8	75.9	80.9	75.9	7269	83.0
1983	5843.0	870	76.5	79.9	76.5	76.0	76.7	76.0	7135	81.4
1984	6374.0	870	83.4	80.3	83.4	76.8	83.4	76.8	7774	88.5
1985	5979.0	870	90.8	81.3	81.1	77.2	78.5	77.0	8077	92.2
1986	4005.0	870	59.2	79.3	54.8	75.2	52.6	74.8	5429	62.0
1987	7337.0	870	98.5	80.9	97.6	77.0	96.3	76.6	8733	99.7
1988	6310.0	870	84.9	81.2	83.9	77.6	82.6	77.0	7520	85.6
1989	6508.0	870	88.4	81.7	87.9	78.3	85.4	77.6	7854	89.7
1990	6683.0	870	90.9	82.3	88.4	78.9	87.7	78.3	8082	92.3
1991	6163.0	870	86.7	82.6	81.0	79.1	80.9	78.4	7714	88.1
1992	6059.0	870	80.5	82.5	79.1	79.1	79.3	78.5	7807	88.9
1993	7317.0	870	99.8	83.4	96.4	80.0	96.0	79.4	8459	96.6
1994	6737.0	863	90.7	83.8	90.0	80.5	89.1	79.9	8018	91.5
1995	5442.0	882	72.9	83.2	70.0	80.0	70.4	79.5	6488	74.1

1996	7210.7	931	88.4	83.5	88.2	80.4	88.2	79.9	7823	89.1
1997	7942.6	962	95.5	84.1	94.3	81.1	94.3	80.6	8385	95.7
1998	7264.0	962	87.4	84.2	86.3	81.3	86.2	80.9	7777	88.8
1999	7272.0	962	86.9	84.4	85.5	81.5	86.3	81.1	7905	90.2
2000	8457.0	962	99.3	85.0	99.3	82.3	100.1	81.9	8782	100.0
2001	6969.0	962	91.2	85.3	82.5	82.3	82.7	82.0	7481	85.4
2002	7047.2	962	86.0	85.3	83.9	82.4	83.6	82.0	7631	87.1
2003	7990.4	962	95.5	85.7	95.1	82.9	94.8	82.5	8552	97.6
2004	7106.5	962	84.5	85.6	84.5	82.9	84.1	82.6	7456	84.9
2005	6811.0	962	82.7	85.5	80.2	82.8	80.8	82.5	7403	84.5
2006	8186.9	962	98.8	86.0	98.8	83.4	97.1	83.0	8693	99.2
2007	7055.9	962	85.6	86.0	85.1	83.4	83.7	83.0	7627	87.1
2008	7264.5	962	86.2	86.0	85.3	83.5	86.0	83.1	7650	87.1
2009	8269.5	962	98.7	86.4	97.8	83.9	98.1	83.6	8679	99.1
2010	7316.1	962	87.5	86.4	86.4	84.0	86.8	83.7	7752	88.5
2011	6848.3	962	82.6	86.3	81.2	83.9	81.3	83.6	7333	83.7
2012	6763.3	962	82.9	86.2	79.4	83.8	80.0	83.5	8784	100.0
2013	6878.1	962	80.9	86.1	80.4	83.7	81.6	83.5	7203	82.2
2014	7192.8	962	85.1	86.0	84.5	83.7	85.4	83.5	7503	85.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		113			110	
C. Inspection, maintenance or repair combined with refuelling	1125			815		
D. Inspection, maintenance or repair without refuelling				10		
L. Human factor related		18			4	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						71
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						7
Z. Other					6	
Subtotal	1125	131	0	825	120	78
Total		1256			1023	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems	113	
14. Safety Systems		16
15. Reactor Cooling Systems		32
16. Steam generation systems		14
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		11
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems		2
42. Electrical Power Supply Systems		11
XX. Miscellaneous Systems		0
Total	113	105

## BE-6 TIHANGE-2

Operator: ELECTRAB (Electrabel)

Contractor: FRAMACEC (FRAMACECO ( FRAMATOME-ACEC-COCKERILL ))

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1008.0 MW(e)  
 Design Net Capacity: 900.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 2056.1 GW(e)·h  
 Energy Availability Factor: 22.9%  
 Load Factor: 23.3%  
 Operating Factor: 23.1%  
 Energy Unavailability Factor: 77.1%  
 Total Off-line Time: 6735 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	739.8	684.4	631.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2056.1
EAF (%)	97.0	99.9	83.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.9
UCF (%)	97.1	99.9	83.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.9
LF (%)	98.6	101.0	84.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.3
OF (%)	98.5	100.0	83.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.1
EUf (%)	3.0	0.1	17.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.1
PUf (%)	0.0	0.0	0.0	0.0	3.2	100.0	35.5	0.0	0.0	0.0	0.0	0.0	11.5
UCLF (%)	3.0	0.1	17.0	100.0	96.8	0.0	64.5	100.0	100.0	100.0	100.0	100.0	65.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

2014-01-08 : UNPLANNED AUTOMATIC SCRAM.FROM 2014-03-26 TO 2014-05-30 : UNPLANNED SHUTDOWN FOR ADDITIONAL TESTS ON REACTOR VESSEL.FROM 2014-05-31 TO 2014-07-11 : PLANNED SHUTDOWN FOR INSPECTION, MAINTENANCE & REFUELLING.FROM 2014-07-12 : CONTINUATION OF UNPLANNED SHUTDOWN FOR ADDITIONAL TESTS ON REACTOR VESSEL.FROM 2014-07-12 TO ... : UNPLANNED SHUTDOWN FOR ADDITIONAL TESTS ON REACTOR VESSEL.FROM 2014-07-12 TO ... : CONTINUATION OF UNPLANNED SHUTDOWN FOR ADDITIONAL TESTS ON REACTOR VESSEL.

### 5. Historical Summary

Date of Construction Start: 01 Apr 1976      Lifetime Generation: 222783.5 GW(e)·h  
 Date of First Criticality: 05 Oct 1982      Cumulative Energy Availability Factor: 83.6%  
 Date of Grid Connection: 13 Oct 1982      Cumulative Load Factor: 83.5%  
 Date of Commercial Operation: 01 Jun 1983      Cumulative Unit Capability Factor: 84.6%  
    Cumulative Energy Unavailability Factor: 16.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	4022.0	901	86.9	86.9	86.9	86.9	86.9	86.9	4612	89.8
1984	6856.0	901	86.4	86.6	86.4	86.6	86.6	86.7	7693	87.6
1985	6636.0	900	89.4	87.7	87.8	87.0	84.2	85.7	7890	90.1
1986	6189.0	900	85.0	86.9	83.1	85.9	78.5	83.7	7509	85.7
1987	6584.0	900	84.3	86.3	83.4	85.4	83.5	83.7	7477	85.4
1988	6966.0	900	89.9	87.0	87.9	85.8	88.1	84.5	7992	91.0
1989	6663.0	901	86.0	86.8	84.7	85.7	84.4	84.5	7728	88.2
1990	6919.0	901	88.5	87.1	88.0	86.0	87.7	84.9	7827	89.3
1991	6850.0	901	88.4	87.2	87.7	86.2	86.8	85.1	7790	88.9
1992	6746.0	901	89.7	87.5	86.9	86.3	85.2	85.1	7912	90.1
1993	6555.0	901	86.4	87.4	83.6	86.0	83.1	84.9	7507	85.7
1994	7585.0	894	98.3	88.3	96.7	86.9	96.9	85.9	8501	97.0
1995	6849.0	921	90.2	88.5	85.0	86.8	84.9	85.9	7697	87.9
1996	7253.0	943	88.6	88.5	87.0	86.8	87.5	86.0	7810	88.9
1997	6854.0	960	82.3	88.0	81.3	86.4	81.5	85.7	7241	82.7
1998	7664.0	960	91.0	88.2	90.6	86.7	91.1	86.0	8015	91.5
1999	8111.0	960	95.5	88.7	95.5	87.2	96.4	86.7	8380	95.7
2000	7481.0	960	89.4	88.7	88.0	87.3	88.7	86.8	7901	89.9

2001	6976.0	960	80.8	88.3	80.7	86.9	83.0	86.6	7137	81.5
2002	7833.4	1008	89.0	88.3	87.9	87.0	88.7	86.7	7821	89.3
2003	7601.0	1008	86.3	88.2	85.6	86.9	86.1	86.7	7589	86.6
2004	8517.3	1008	96.4	88.6	96.0	87.3	96.2	87.2	8478	96.5
2005	7890.0	1008	90.1	88.7	89.5	87.4	89.4	87.3	7929	90.5
2006	7219.3	1008	83.0	88.4	82.4	87.2	81.8	87.0	7348	83.9
2007	8751.6	1008	100.0	88.9	99.9	87.8	99.1	87.5	8760	100.0
2008	7129.3	1008	81.1	88.6	80.4	87.5	80.5	87.2	7165	81.6
2009	7732.3	1008	86.8	88.5	86.7	87.4	87.6	87.3	7664	87.5
2010	8823.8	1008	99.5	89.0	99.2	87.9	99.9	87.7	8726	99.6
2011	7322.5	1008	83.3	88.8	82.9	87.7	82.9	87.6	7345	83.8
2012	5506.1	1008	62.1	87.8	61.8	86.8	62.2	86.7	5475	62.3
2013	4939.3	1008	55.8	86.7	55.6	85.7	55.9	85.6	4963	56.7
2014	2056.1	1008	22.9	84.6	22.9	83.6	23.3	83.5	2025	23.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		5716			303	
C. Inspection, maintenance or repair combined with refuelling	1008			704	4	
D. Inspection, maintenance or repair without refuelling				72		
E. Testing of plant systems or components					2	
H. Nuclear regulatory requirements					0	
J. Grid limitation, failure or grid unavailability						0
L. Human factor related		10			34	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						12
Z. Other				11	1	
Subtotal	1008	5726	0	787	344	12
Total		6734			1143	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	5716	190
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		5
14. Safety Systems		1
15. Reactor Cooling Systems		14
16. Steam generation systems		23
31. Turbine and auxiliaries		21
32. Feedwater and Main Steam System		10
41. Main Generator Systems		2
42. Electrical Power Supply Systems		12
XX. Miscellaneous Systems		14
Total	5716	298

**BE-8 TIHANGE-3****Operator:** ELECTRAB (Electrabel)**Contractor:** ACECOWEN (ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE ))**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1046.0 MW(e)

**Design Net Capacity:** 1020.0 MW(e)

**Design Discharge Burnup:** 45000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 8800.7 GW(e)·h

**Energy Availability Factor:** 96.6%

**Load Factor:** 96.0%

**Operating Factor:** 97.6%

**Energy Unavailability Factor:** 3.4%

**Total Off-line Time:** 210 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	774.1	698.8	772.9	744.9	768.5	738.8	758.1	730.2	744.0	772.5	734.3	563.6	8800.7
<b>EAF (%)</b>	99.5	99.4	99.5	98.9	98.8	98.1	97.4	93.8	98.8	99.2	99.4	77.0	96.6
<b>UCF (%)</b>	99.5	99.4	99.5	99.4	99.1	99.8	99.8	95.4	99.9	100.0	100.0	100.0	99.3
<b>LF (%)</b>	99.5	99.4	99.4	98.9	98.8	98.1	97.4	93.8	98.8	99.1	97.5	72.4	96.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.1	73.7	97.6
<b>EUf (%)</b>	0.5	0.6	0.5	1.1	1.2	1.9	2.6	6.2	1.2	0.8	0.6	23.0	3.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.5	0.6	0.5	0.6	0.9	0.2	0.1	4.6	0.0	0.0	0.0	0.0	0.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.5	0.3	1.6	2.3	1.5	1.1	0.8	0.6	23.0	2.7

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

2014-11-30 : UNPLANNED AUTOMATIC SCRAM DUE TO FIRE IN A CURRENT TRANSFORMER OF HIGH VOLTAGE SUBSTATION (BELONGING TO GRID DISPATCHER). 2014-12-24 : PLANNED SHUTDOWN TO SAVE FUEL (TO POSTPONE PLANNED SHUTDOWN FOR REFUELLING AND MAINTENANCE IN ORDER TO AVOID A BLACK-OUT).

**5. Historical Summary**

**Date of Construction Start:** 01 Nov 1978 **Lifetime Generation:** 232051.9 GW(e)·h

**Date of First Criticality:** 05 Jun 1985 **Cumulative Energy Availability Factor:** 88.2%

**Date of Grid Connection:** 15 Jun 1985 **Cumulative Load Factor:** 87.9%

**Date of Commercial Operation:** 01 Sep 1985 **Cumulative Unit Capability Factor:** 89.7%

**Cumulative Energy Unavailability Factor:** 11.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985			Data not provided							
1986	7558.0	1020	86.5	86.5	85.6	85.6	84.6	84.6	7733	88.3
1987	7829.0	1020	89.0	87.8	87.3	86.4	87.6	86.1	7872	89.9
1988	7623.0	1020	87.4	87.6	85.0	86.0	85.1	85.8	7773	88.5
1989	7749.0	1020	87.5	87.6	87.0	86.2	86.7	86.0	7790	88.9
1990	7794.0	1020	90.0	88.1	87.1	86.4	87.2	86.2	7924	90.5
1991	7649.0	1020	88.3	88.1	86.2	86.4	85.6	86.1	7903	90.2
1992	8335.0	1020	93.4	88.9	93.3	87.4	93.0	87.1	8246	93.9
1993	7748.0	1020	89.5	88.9	88.1	87.4	86.7	87.1	7874	89.9
1994	7480.0	1015	86.8	88.7	84.7	87.1	84.1	86.7	7666	87.5
1995	7559.0	1015	86.7	88.5	84.7	86.9	85.0	86.6	7632	87.1
1996	7189.0	1015	81.1	87.8	81.1	86.4	80.6	86.0	7142	81.3
1997	8357.0	1015	99.2	88.8	94.4	87.0	94.0	86.7	8342	95.2
1998	6738.0	1015	77.9	87.9	75.9	86.2	75.8	85.9	6903	78.8
1999	8799.0	1015	99.1	88.7	98.9	87.1	99.0	86.8	8686	99.2
2000	7597.0	1015	86.4	88.6	84.9	86.9	85.2	86.7	7656	87.2
2001	7729.0	1015	89.9	88.7	86.5	86.9	86.9	86.7	7929	90.5
2002	8340.5	1015	95.7	89.1	93.7	87.3	93.8	87.1	8368	95.5
2003	7661.5	1015	89.4	89.1	86.5	87.3	86.2	87.1	7846	89.6
2004	7936.4	1015	90.4	89.2	89.2	87.4	89.0	87.2	7969	90.7
2005	8707.5	1015	99.8	89.7	99.6	88.0	97.9	87.7	8753	99.9

2006	7237.6	1015	86.1	89.5	83.3	87.8	81.4	87.4	7592	86.7
2007	7339.4	1015	83.4	89.2	83.0	87.5	82.5	87.2	7406	84.5
2008	8385.3	1015	94.3	89.5	93.9	87.8	94.0	87.5	8365	95.2
2009	7717.2	1054	85.2	89.3	84.6	87.7	84.6	87.4	7480	85.4
2010	7563.2	1046	82.5	89.0	81.9	87.4	82.0	87.1	7489	85.5
2011	8981.9	1046	99.1	89.4	98.0	87.9	98.0	87.6	8701	99.3
2012	7974.7	1046	88.2	89.4	87.8	87.9	86.8	87.5	7800	88.8
2013	8094.1	1046	88.9	89.3	88.3	87.9	88.3	87.6	7839	89.5
2014	8800.7	1046	99.3	89.7	96.6	88.2	96.0	87.9	8550	97.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					119	
C. Inspection, maintenance or repair combined with refuelling				654	8	
D. Inspection, maintenance or repair without refuelling				28		
E. Testing of plant systems or components				1		
H. Nuclear regulatory requirements					1	
J. Grid limitation, failure or grid unavailability			41			
L. Human factor related					3	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)			168	18		13
Z. Other				5		
Subtotal	0	0	209	706	131	13
Total	209			850		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		5
15. Reactor Cooling Systems		21
16. Steam generation systems		38
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		34
32. Feedwater and Main Steam System		1
33. Circulating Water System		7
41. Main Generator Systems		2
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		0
Total	0	113

**BR-1 ANGRA-1****Operator:** ELETRONU (ELETROBRAS ELETRONUCLEAR S.A.)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP at the beginning of 2014:** 609.0 MW(e)

**Design Net Capacity:** 626.0 MW(e)

**Design Discharge Burnup:** 33000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 4706.8 GW(e)·h

**Energy Availability Factor:** 88.2%

**Load Factor:** 88.2%

**Operating Factor:** 89.7%

**Energy Unavailability Factor:** 11.8%

**Total Off-line Time:** 903 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	446.1	392.5	385.8	0.0	365.3	428.9	455.4	453.3	439.2	452.6	436.1	451.7	4706.8
<b>EAF (%)</b>	98.5	95.8	85.1	0.0	80.6	97.8	100.0	100.0	100.0	100.0	99.5	99.7	88.2
<b>UCF (%)</b>	100.0	96.9	86.4	0.0	80.6	97.8	100.0	100.0	100.0	100.0	99.8	99.9	88.5
<b>LF (%)</b>	98.5	95.8	85.1	0.0	80.6	97.8	100.5	100.0	100.2	100.0	99.5	99.7	88.2
<b>OF (%)</b>	100.0	96.9	90.2	0.0	88.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.7
<b>EUf (%)</b>	1.5	4.2	14.9	100.0	19.4	2.2	0.0	0.0	0.0	0.0	0.5	0.3	11.8
<b>PUf (%)</b>	0.0	0.0	10.4	100.0	12.5	0.0	0.0	0.0	0.0	0.0	0.2	0.1	10.2
<b>UCLF (%)</b>	0.0	3.1	3.3	0.0	6.9	2.2	0.0	0.0	0.0	0.0	0.0	0.0	1.3
<b>XUF (%)</b>	1.5	1.1	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.4

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

- ON 28TH FEBRUARY, AT 03:18AM DURING THE EXECUTION OF THE PI-124A (TEST PERFORMANCE OF SECURITY DEVICES - INJECTION SAFETY - TRAIN B - RELAY K602) PROCEDURE, THE STEAM ISOLATION VALVE HV-4521 WAS CLOSED WHICH CAUSED AN INCREASE IN PRESSURE OF THE SG (STEAM GENERATOR-2) AND OF THE FLOW OF STEAM IN THE SG-1. THE CLOSURE OF MAIN FEED WATER ISOLATION VALVES HV 1300 AND 1301 OCCURRED AND AS A CONSEQUENCE AN AUTOMATIC REACTOR TRIP OCCURRED BY HIGH PRESSURE IN THE PRESSURIZER (PZR).- ON MAY THE 5TH, AT 11:39 AM A SCRAM OCCURRED DUE TO A TURBINE TRIP CAUSED BY A LEAK IN THE TURBINE CONTROL SYSTEM FLUID.THE LEAKAGE OF THE TURBINE CONTROL SYSTEM FLUID OCCURRED IN THE PIPE FLANGE CONNECTION TO THE INTERCEPTING VALVE IV-2A, WHICH CAUSED LOW FLUID LEVEL IN THE RESERVOIR AND LOW PRESSURE IN THE SYSTEM, AND AS A CONSEQUENCE THE REACTOR TRIPPED.

**5. Historical Summary**

**Date of Construction Start:** 01 May 1971 **Lifetime Generation:** 82906.0 GW(e)·h

**Date of First Criticality:** 13 Mar 1982 **Cumulative Energy Availability Factor:** 58.5%

**Date of Grid Connection:** 01 Apr 1982 **Cumulative Load Factor:** 50.2%

**Date of Commercial Operation:** 01 Jan 1985 **Cumulative Unit Capability Factor:** 64.4%

**Cumulative Energy Unavailability Factor:** 41.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	3169.4	626	57.8	57.8	57.8	57.8	57.8	57.8	6847	78.2
1986	132.4	626	3.7	30.7	3.7	30.7	2.4	30.1	512	5.8
1987	910.6	626	19.7	27.1	19.7	27.1	16.6	25.6	1958	22.4
1988	566.6	626	18.5	24.9	18.5	24.9	10.3	21.8	1488	16.9
1989	1695.1	626	61.8	32.3	61.3	32.2	30.9	23.6	5362	61.2
1990	2055.3	626	86.1	41.3	82.5	40.6	37.5	25.9	7400	84.5
1991	1306.4	626	57.2	43.5	57.2	43.0	23.8	25.6	5046	57.6
1992	1506.4	626	47.9	44.1	47.9	43.6	27.4	25.8	4275	48.7
1993	402.7	626	17.2	41.1	17.2	40.6	7.3	23.8	1524	17.4
1994	41.5	626	83.8	45.4	3.5	36.9	0.8	21.5	305	3.5
1995	2333.6	626	92.8	49.7	42.6	37.4	42.6	23.4	8127	92.8
1996	2288.8	626	67.0	51.1	55.2	38.9	41.6	24.9	5063	57.6
1997	2990.0	626	60.7	51.9	53.2	40.0	54.5	27.2	6219	71.0
1998	3093.8	626	56.4	52.2	56.4	41.2	56.4	29.3	6976	79.6

1999	3631.7	626	65.2	53.0	64.8	42.8	66.2	31.7	8429	96.2
2000	3164.9	626	58.7	53.4	58.7	43.8	57.6	33.4	6514	74.2
2001	3614.4	626	82.9	55.1	82.9	46.1	65.9	35.3	7295	83.3
2002	3775.2	626	87.7	56.9	85.9	48.3	68.8	37.1	7595	86.7
2003	3137.1	626	74.5	57.9	57.2	48.7	57.2	38.2	6551	74.8
2004	3890.2	626	70.7	58.5	70.7	49.8	70.7	39.8	7968	90.7
2005	3520.4	626	83.0	59.7	83.0	51.4	64.2	41.0	7275	83.0
2006	3205.2	626	64.0	59.9	64.0	52.0	58.4	41.8	6743	77.0
2007	2553.5	520	62.8	60.0	62.8	52.4	56.1	42.3	5481	62.6
2008	3314.5	491	78.6	60.6	78.6	53.3	76.9	43.4	6967	79.3
2009	2668.9	609	57.4	60.5	57.4	53.4	50.9	43.7	5256	60.0
2010	4076.7	609	77.0	61.1	77.0	54.3	76.4	45.0	7055	80.5
2011	4452.5	609	88.8	62.1	88.6	55.6	83.5	46.4	7789	88.9
2012	5134.9	609	97.4	63.4	97.4	57.1	96.0	48.1	8734	99.4
2013	3734.8	609	70.9	63.6	70.9	57.5	70.0	48.9	6765	77.2
2014	4706.8	609	88.5	64.4	88.2	58.5	88.2	50.2	7857	89.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		51			1277	
B. Refuelling without a maintenance				31		
C. Inspection, maintenance or repair combined with refuelling	850			954		
D. Inspection, maintenance or repair without refuelling				266		
E. Testing of plant systems or components				56	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				95		
H. Nuclear regulatory requirements					0	
J. Grid limitation, failure or grid unavailability						9
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						7
L. Human factor related					5	
M. Governmental requirements or court decisions						250
P. Fire					0	
Z. Other					19	2
Subtotal	850	51	0	1402	1301	268
Total		901			2971	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		306
12. Reactor I&C Systems		54
13. Reactor Auxiliary Systems		94
14. Safety Systems	21	
15. Reactor Cooling Systems		13
16. Steam generation systems		35
31. Turbine and auxiliaries	30	96
32. Feedwater and Main Steam System		49
33. Circulating Water System		7
41. Main Generator Systems		413
42. Electrical Power Supply Systems		207
Total	51	1274



## BR-2 ANGRA-2

**Operator:** ELETRONU (ELETROBRAS ELETRONUCLEAR S.A.)

**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1275.0 MW(e)  
**Design Net Capacity:** 1245.0 MW(e)  
**Design Discharge Burnup:** 35000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 9756.5 GW(e)·h  
**Energy Availability Factor:** 86.6%  
**Load Factor:** 87.4%  
**Operating Factor:** 88.5%  
**Energy Unavailability Factor:** 13.4%  
**Total Off-line Time:** 1006 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	937.6	860.2	949.6	922.3	947.7	867.9	403.2	132.0	933.4	961.0	883.6	958.0	9756.5
<b>EAF (%)</b>	98.8	100.0	100.0	100.0	99.1	94.5	42.5	13.6	100.0	99.9	92.9	100.0	86.6
<b>UCF (%)</b>	98.8	100.0	100.0	100.0	99.1	100.0	61.3	13.6	100.0	99.9	92.9	100.0	88.6
<b>LF (%)</b>	98.8	100.4	100.1	100.5	99.9	94.5	42.5	13.9	101.7	101.3	96.3	101.0	87.4
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	58.1	13.6	100.0	100.0	92.9	100.0	88.5
<b>EUf (%)</b>	1.2	0.0	0.0	0.0	0.9	5.5	57.5	86.4	0.0	0.1	7.1	0.0	13.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.9	0.0	38.7	61.3	0.0	0.0	0.0	0.0	8.6
<b>UCLF (%)</b>	1.2	0.0	0.0	0.0	0.0	0.0	0.0	25.1	0.0	0.1	7.1	0.0	2.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	5.5	18.8	0.0	0.0	0.0	0.0	0.0	2.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

JANUARY - POWER REDUCTION DUE TO HIGH TEMPERATURE IN THE COOLING WATER OF THE LOAD BREAKER SWITCH. MAY - REDUCED POWER FOR ENGINE BEARING EXCHANGE MAIN COOLING WATER PUMP JULY - INITIATED THE STRETCH OUT OF THE CYCLE 11 IN THE FIRST PHASE WITH REDUCED AVERAGE TEMPERATURE OF THE REACTOR COOLING SYSTEM AND IN THE SECOND PHASE WITH POWER REDUCTION TO ABOUT 1% PER DAY. AUGUST - UNPLANNED EXTENSION OF REFUELLING OUTAGE CAUSED BY DELAY OF SPECIAL TOOLS TO GET IN BRASIL USED FOR TURBINE GENERATOR PARTIAL DISCHARGE AND OVERALL ISOLATION TESTS. OCTOBER - DISARM THE MAIN COOLING PUMP PAC20AP001 DUE TO HIGH TEMPERATURE ALARM IN A MOTOR WINDING PHASE (SENSOR FAILURE). NOVEMBER - REACTOR TRIP DUE TO LOSS OF 2 OF 4 REACTOR COOLANT PUMPS (JEB) BY ACTION OF THE GENERATOR IMPEDANCE RELAY.

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1976 **Lifetime Generation:** 131780.5 GW(e)·h  
**Date of First Criticality:** 14 Jul 2000 **Cumulative Energy Availability Factor:** 86.1%  
**Date of Grid Connection:** 21 Jul 2000 **Cumulative Load Factor:** 82.5%  
**Date of Commercial Operation:** 01 Feb 2001 **Cumulative Unit Capability Factor:** 87.6%  
**Cumulative Energy Unavailability Factor:** 13.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2001	9272.9	1350	94.3	94.3	94.2	94.2	85.7	85.7	7797	97.3
2002	9238.2	1275	91.3	92.8	83.3	88.7	82.7	84.2	8060	92.0
2003	9419.0	1275	91.0	92.2	84.3	87.2	84.3	84.2	8019	91.5
2004	6919.8	1275	72.8	87.3	72.8	83.6	61.8	78.6	6497	74.0
2005	5676.7	1275	63.7	82.5	63.7	79.6	50.8	73.0	5581	63.7
2006	9778.3	1275	89.3	83.7	89.3	81.2	87.5	75.4	8014	91.5
2007	9096.9	1275	85.9	84.0	84.7	81.7	81.4	76.3	7606	86.8
2008	9894.0	1275	90.1	84.8	89.1	82.6	88.3	77.8	7924	90.2
2009	9554.7	1275	92.4	85.6	91.7	83.6	85.5	78.7	8068	92.1
2010	9697.4	1275	87.9	85.8	87.1	84.0	86.8	79.5	7727	88.2
2011	10342.3	1275	99.1	87.0	99.0	85.4	92.6	80.7	8682	99.1
2012	10035.5	1275	89.5	87.3	89.5	85.7	89.6	81.4	8064	91.8
2013	10045.3	1275	90.1	87.5	90.1	86.0	89.9	82.1	7961	90.9
2014	9756.5	1275	88.6	87.6	86.6	86.1	87.4	82.5	7754	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2000 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		51			213	
C. Inspection, maintenance or repair combined with refuelling	744			477	35	
D. Inspection, maintenance or repair without refuelling				218		
E. Testing of plant systems or components				3	1	
J. Grid limitation, failure or grid unavailability						5
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)		187				
Subtotal	744	238	0	698	249	5
Total		982			952	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2000 to 2014 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		41
15. Reactor Cooling Systems		21
16. Steam generation systems		0
31. Turbine and auxiliaries		6
32. Feedwater and Main Steam System		2
33. Circulating Water System		3
41. Main Generator Systems		66
42. Electrical Power Supply Systems	51	71
Total	51	210

**BG-5 KOZLODUY-5**

**Operator:** KOZNPP (Kozloduy NPP Plc)  
**Contractor:** AEE (ATOMENERGOEXPORT)

**1. Station Details**

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 963.0 MW(e)  
**Design Net Capacity:** 953.0 MW(e)  
**Design Discharge Burnup:** 27000 MW·d/t  
**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 7580.9 GW(e)·h  
**Energy Availability Factor:** 89.7%  
**Load Factor:** 89.9%  
**Operating Factor:** 90.3%  
**Energy Unavailability Factor:** 10.3%  
**Total Off-line Time:** 848 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	727.5	660.4	732.1	449.6	92.5	678.5	705.0	706.5	687.8	714.3	701.9	724.7	7580.9
<b>EAF (%)</b>	100.0	100.0	100.0	63.2	20.2	98.3	98.4	98.6	99.2	99.1	100.0	100.0	89.7
<b>UCF (%)</b>	100.0	100.0	100.0	63.4	20.2	98.3	100.0	100.0	99.2	99.1	100.0	100.0	89.9
<b>LF (%)</b>	101.5	102.1	102.2	64.8	12.9	97.9	98.4	98.6	99.2	99.7	101.2	101.1	89.9
<b>OF (%)</b>	100.0	100.0	99.9	63.8	21.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3
<b>EUf (%)</b>	0.0	0.0	0.0	36.8	79.8	1.7	1.6	1.4	0.8	0.9	0.0	0.0	10.3
<b>PUf (%)</b>	0.0	0.0	0.0	36.6	79.8	1.2	0.0	0.0	0.8	0.9	0.0	0.0	10.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.2	0.0	0.0	1.6	1.4	0.0	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

UNIT 5 WAS OPERATED ON BASE LOAD MODE IN ACCORDANCE WITH THE LOAD SCHEDULE AGREED BY BULGARIAN TRANSMISSION SYSTEM OPERATOR (TSO). THE PLANNED OUTAGE FOR ANNUAL MAINTENANCE ACTIVITIES, REFUELLING AND MODERNIZATION WAS PERFORMED IN THE PERIOD 20TH APRIL – 25TH MAY (TOTAL OUTAGE DURATION - 35 DAYS). IN 2014 THERE WERE NO UNPLANNED REACTOR SCRAM OR SIGNIFICANT OPERATIONAL EVENTS RELATED TO THE SAFETY OR ENERGY LOSSES.

**5. Historical Summary**

**Date of Construction Start:** 09 Jul 1980 **Lifetime Generation:** 134282.0 GW(e)·h  
**Date of First Criticality:** 05 Nov 1987 **Cumulative Energy Availability Factor:** 69.3%  
**Date of Grid Connection:** 29 Nov 1987 **Cumulative Load Factor:** 61.5%  
**Date of Commercial Operation:** 23 Dec 1988 **Cumulative Unit Capability Factor:** 71.8%  
**Cumulative Energy Unavailability Factor:** 30.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	635.9	887	100.0	100.0	100.0	100.0	96.4	96.4	744	100.0
1989	3355.1	953	51.5	55.1	51.5	55.1	40.2	44.3	4663	53.2
1990	3380.9	953	58.1	56.5	41.8	48.7	40.5	42.5	5592	63.8
1991	1950.4	953	31.7	48.5	31.7	43.2	23.4	36.3	2777	31.7
1992	3540.7	953	56.7	50.5	47.0	44.1	42.3	37.7	4982	56.7
1993	3278.0	953	50.5	50.5	47.5	44.8	39.3	38.0	4675	53.4
1994	2880.4	953	52.6	50.8	48.1	45.3	34.5	37.5	4350	49.7
1995	4699.3	953	68.1	53.3	59.4	47.3	56.3	40.1	5988	68.4
1996	4720.3	953	73.8	55.8	73.8	50.6	56.4	42.1	6468	73.6
1997	4410.2	953	68.7	57.2	68.7	52.6	52.8	43.3	6034	68.9
1998	3741.0	953	73.3	58.8	73.3	54.6	44.8	43.5	6467	73.8
1999	3423.2	953	54.8	58.5	50.4	54.3	41.0	43.2	4838	55.2
2000	4340.8	1000	63.5	58.9	54.4	54.3	49.4	43.8	5406	61.5
2001	5049.6	953	66.6	59.5	61.5	54.8	60.5	45.0	5940	67.8
2002	5095.8	953	79.8	60.9	79.4	56.6	61.0	46.2	7003	79.9
2003	5596.7	953	98.6	63.4	98.6	59.3	67.0	47.6	8579	97.9
2004	4842.0	953	67.2	63.7	67.2	59.8	57.8	48.2	5906	67.2
2005	5513.5	953	75.2	64.3	75.2	60.7	66.0	49.2	6641	75.8
2006	6047.0	953	75.8	65.0	75.7	61.6	72.4	50.5	6691	76.4

2007	6669.9	953	80.4	65.8	80.2	62.5	79.9	52.1	7090	80.9
2008	7341.3	953	88.4	66.9	87.9	63.8	87.7	53.8	7796	88.8
2009	7181.5	953	88.3	67.9	87.7	64.9	86.0	55.4	7759	88.6
2010	7293.3	953	86.4	68.7	85.9	65.9	87.4	56.8	7620	87.0
2011	7639.3	953	89.8	69.7	89.7	66.9	91.5	58.3	7878	89.9
2012	7534.5	953	89.4	70.5	89.1	67.8	90.0	59.6	7876	89.7
2013	6569.8	953	86.0	71.1	85.1	68.5	78.7	60.4	7551	86.2
2014	7580.9	963	89.9	71.8	89.7	69.3	89.9	61.5	7912	90.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					146	
C. Inspection, maintenance or repair combined with refuelling	847			1487		
D. Inspection, maintenance or repair without refuelling				189		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				90		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						1
L. Human factor related					7	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Subtotal	847	0	0	1766	153	1
Total	847			1920		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		7
16. Steam generation systems		9
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		13
35. All other I&C Systems		1
41. Main Generator Systems		88
42. Electrical Power Supply Systems		2
Total	0	141

## BG-6 KOZLODUY-6

**Operator:** KOZNPP (Kozloduy NPP Plc)  
**Contractor:** AEE (ATOMENERGOEXPORT)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 963.0 MW(e)  
**Design Net Capacity:** 953.0 MW(e)  
**Design Discharge Burnup:** 27000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7433.1 GW(e)·h  
**Energy Availability Factor:** 88.0%  
**Load Factor:** 88.1%  
**Operating Factor:** 89.8%  
**Energy Unavailability Factor:** 12.0%  
**Total Off-line Time:** 897 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	728.5	658.7	680.9	696.3	712.4	664.4	704.7	650.4	225.7	260.9	712.1	738.1	7433.1
<b>EAF (%)</b>	100.0	100.0	100.0	99.4	99.4	100.0	98.4	90.8	32.6	36.4	100.0	100.0	88.0
<b>UCF (%)</b>	100.0	100.0	100.0	99.4	99.4	100.0	100.0	92.9	39.9	36.4	100.0	100.0	89.0
<b>LF (%)</b>	101.7	101.8	95.0	100.4	99.4	95.8	98.4	90.8	32.6	36.4	102.7	103.0	88.1
<b>OF (%)</b>	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	40.3	37.4	100.0	100.0	89.8
<b>EUf (%)</b>	0.0	0.0	0.0	0.6	0.6	0.0	1.6	9.2	67.4	63.6	0.0	0.0	12.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.6	0.6	0.0	0.0	7.1	60.1	63.6	0.0	0.0	11.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.6	2.2	7.4	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT 6 WAS OPERATED ON BASE LOAD MODE IN ACCORDANCE WITH THE LOAD SCHEDULE AGREED BY BULGARIAN TRANSMISSION SYSTEM OPERATOR (TSO), INCL. FUEL COAST DOWN MODE. THE PLANNED OUTAGE FOR ANNUAL MAINTENANCE ACTIVITIES AND REFUELLING WAS PERFORMED IN THE PERIOD 13 TH SEPTEMBER – 20 TH OCTOBER (TOTAL OUTAGE DURATION – 37 DAYS). THE PLANNED GENERATOR STATOR REPLACEMENT WAS NOT PERFORMED DUE TO THE STATOR DELIVERY DELAY CAUSED BY UNFAVOURABLE CONDITIONS TO SHIPPING TRANSPORTATION (DANUBE RIVER LOW LEVEL). IT IS ENFORCED REARRANGEMENT OF THE OPERATION MODE AND THE PLANNED OUTAGE PERIOD. IN 2014 THERE WERE NO ANY UNPLANNED REACTOR SCRAM OR SIGNIFICANT OPERATIONAL EVENTS RELATED TO THE SAFETY OR ENERGY LOSSES.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1982  
**Date of First Criticality:** 29 May 1991  
**Date of Grid Connection:** 02 Aug 1991  
**Date of Commercial Operation:** 30 Dec 1993

**Lifetime Generation:** 121393.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 75.9%  
**Cumulative Load Factor:** 68.7%  
**Cumulative Unit Capability Factor:** 78.1%  
**Cumulative Energy Unavailability Factor:** 24.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1993	59.9	953	91.2	91.2	91.2	91.2	8.4	8.4	678	91.1
1994	4862.6	953	88.7	88.9	87.6	87.9	58.2	54.3	7817	89.2
1995	3831.9	953	63.6	76.8	63.6	76.2	45.9	50.3	5568	63.6
1996	5495.9	953	76.2	76.6	76.2	76.2	65.7	55.3	6698	76.3
1997	4825.4	953	72.8	75.7	72.8	75.4	57.8	55.9	6380	72.8
1998	3970.0	953	63.7	73.3	63.7	73.1	47.6	54.3	6079	69.4
1999	4407.8	953	69.6	72.7	60.7	71.1	52.8	54.0	6194	70.7
2000	4064.3	1000	66.8	71.8	51.2	68.1	46.3	52.9	5772	65.7
2001	4189.4	953	63.4	70.8	50.4	66.0	50.2	52.5	5441	62.1
2002	5324.9	953	71.5	70.9	71.5	66.6	63.8	53.8	6256	71.4
2003	5480.6	953	72.9	71.1	72.9	67.2	65.6	54.9	6474	73.9
2004	5298.1	953	75.3	71.4	75.2	67.9	63.3	55.7	6614	75.3
2005	6150.0	953	77.0	71.9	76.9	68.7	73.7	57.2	6772	77.3
2006	5917.3	953	77.1	72.3	77.0	69.3	70.9	58.2	6821	77.9
2007	7024.8	953	85.0	73.2	84.7	70.4	84.1	60.1	7493	85.5
2008	7400.2	953	88.1	74.2	87.2	71.5	88.4	61.9	7753	88.3

2009	7037.4	953	86.2	74.9	85.6	72.4	84.3	63.3	7562	86.3
2010	6943.1	953	83.7	75.4	82.7	73.0	83.2	64.5	7387	84.3
2011	7624.9	953	90.4	76.3	90.3	73.9	91.3	66.0	7962	90.9
2012	7326.4	953	88.5	76.9	87.9	74.7	87.5	67.1	7842	89.3
2013	6746.3	953	89.1	77.5	88.3	75.3	80.8	67.8	7848	89.6
2014	7433.1	963	89.0	78.1	88.0	75.9	88.1	68.7	7863	89.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1992 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					167	
C. Inspection, maintenance or repair combined with refuelling	896			1367		
D. Inspection, maintenance or repair without refuelling				98		
E. Testing of plant systems or components				7	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				94		
J. Grid limitation, failure or grid unavailability						3
Subtotal	896	0	0	1566	167	3
Total		896			1736	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1992 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		11
14. Safety Systems		22
31. Turbine and auxiliaries		12
32. Feedwater and Main Steam System		1
35. All other I&C Systems		0
41. Main Generator Systems		9
42. Electrical Power Supply Systems		109
Total	0	164

# CA-8 BRUCE-1

Operator: BRUCEPOW (Bruce Power)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 772.0 MW(e)  
 Design Net Capacity: 732.0 MW(e)  
 Design Discharge Burnup: 8750 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5631.0 GW(e)·h  
 Energy Availability Factor: 85.5%  
 Load Factor: 83.3%  
 Operating Factor: 86.1%  
 Energy Unavailability Factor: 14.5%  
 Total Off-line Time: 1220 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	199.3	471.0	461.6	553.6	508.5	319.3	566.6	563.6	541.9	336.8	546.4	562.5	5631.0
EAF (%)	34.7	92.6	82.9	100.0	90.6	59.8	100.0	100.0	100.0	67.0	100.0	100.0	85.5
UCF (%)	34.7	92.6	82.9	100.0	90.6	59.8	100.0	100.0	100.0	67.0	100.0	100.0	85.5
LF (%)	34.7	90.8	80.4	99.6	88.5	57.4	98.6	98.1	97.5	58.6	98.3	97.9	83.3
OF (%)	32.8	93.3	84.9	100.0	91.5	61.8	100.0	100.0	100.0	69.8	100.0	100.0	86.1
EUf (%)	65.3	7.4	17.1	0.0	9.4	40.2	0.0	0.0	0.0	33.0	0.0	0.0	14.5
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	65.3	7.4	17.2	0.0	9.4	40.3	0.0	0.0	0.0	33.0	0.0	0.0	14.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

UNIT 1 DEMONSTRATED STRONG PERFORMANCE DURING THE THIRD AND FOURTH QUARTER OF THE YEAR. THE UNIT INCURRED SIGNIFICANT FORCED LOSSES DUE TO PASSING QUICK ACTING VALVES ON SHUTDOWN SYSTEM 2 AND A FORCED OUTAGED DUE TO WATER INGRESS IN THE TURBINE SYSTEM.

## 5. Historical Summary

Date of Construction Start: 01 Jun 1971      Lifetime Generation: 103200.0 GW(e)·h  
 Date of First Criticality: 17 Dec 1976      Cumulative Energy Availability Factor: 66.9%  
 Date of Grid Connection: 14 Jan 1977      Cumulative Load Factor: 65.8%  
 Date of Commercial Operation: 01 Sep 1977      Cumulative Unit Capability Factor: 67.5%  
    Cumulative Energy Unavailability Factor: 33.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	1860.7	740	88.4	88.4	88.4	88.4	88.0	88.0	2698	94.5
1978	4152.6	740	72.6	76.5	72.6	76.5	64.2	70.1	6649	76.1
1979	5018.8	740	81.5	78.7	81.5	78.7	76.6	72.9	7334	82.8
1980	5597.5	740	86.2	80.9	86.2	80.9	86.1	76.9	7902	90.0
1981	6253.3	740	96.7	84.6	96.7	84.6	96.5	81.4	8486	96.9
1982	5914.9	740	88.8	85.4	88.8	85.4	91.2	83.2	7884	90.0
1983	5802.8	740	84.8	85.3	84.8	85.3	89.5	84.2	7590	86.6
1984	6457.6	740	94.8	86.6	94.8	86.6	99.3	86.3	8546	97.3
1985	6417.4	772	100.0	88.2	94.9	87.6	94.8	87.4	8349	95.3
1986	4398.0	770	66.0	85.8	65.3	85.1	65.2	84.9	5783	66.0
1987	4087.1	848	63.3	83.3	60.7	82.5	55.0	81.7	5462	62.4
1988	4642.7	848	66.8	81.7	66.0	80.9	62.3	79.8	6066	69.1
1989	5094.8	848	69.9	80.7	68.7	79.8	68.6	78.8	7543	86.1
1990	2451.1	848	33.6	76.8	33.0	76.0	33.0	75.0	4629	52.8
1991	2394.4	848	34.1	73.6	32.2	72.7	32.2	71.8	3467	39.6
1992	4546.5	848	61.0	72.7	61.0	71.8	61.0	71.0	7484	85.2
1993	3389.2	848	45.7	70.9	45.7	70.1	45.6	69.4	6869	78.4
1994	3849.0	848	51.8	69.7	51.8	69.0	51.8	68.3	7094	81.0
1995	3531.4	848	47.5	68.5	47.5	67.7	47.5	67.1	5827	66.5
1996	4326.4	848	58.1	67.9	58.1	67.2	58.1	66.6	7306	83.2
1997	1383.6	848	23.5	66.0	23.5	65.4	23.5	64.8	2254	32.5

1998	Data not available - Long-term shutdown									
1999	"									
2000	"									
2001	"									
2002	"									
2003	"									
2004	"									
2005	"									
2006	"									
2007	"									
2008	"									
2009	"									
2010	"									
2011	"									
2012	743.6	772	42.1	65.7	42.1	65.1	38.6	64.4	1365	54.7
2013	5257.1	772	86.1	66.6	86.0	66.0	77.7	65.0	7883	90.0
2014	5631.0	772	85.5	67.5	85.5	66.9	83.3	65.8	7540	86.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1221			545	
D. Inspection, maintenance or repair without refuelling				484		
E. Testing of plant systems or components				59	2	
H. Nuclear regulatory requirements					13	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					4	
P. Fire					3	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						10
Z. Other				8	1	
Subtotal	0	1221	0	551	568	14
Total		1221			1133	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		31
12. Reactor I&C Systems		56
13. Reactor Auxiliary Systems		65
14. Safety Systems	624	27
15. Reactor Cooling Systems		58
16. Steam generation systems		174
21. Fuel Handling and Storage Facilities		21
31. Turbine and auxiliaries	352	19
32. Feedwater and Main Steam System		18
41. Main Generator Systems	112	43
42. Electrical Power Supply Systems	131	14
XX. Miscellaneous Systems		14
Total	1219	540



**Contractor:** OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 2. Production Summary 2014

**Net Energy Production:** 4910.3 GW(e)·h

**Energy Availability Factor:** 81.7%

**Load Factor:** 76.4%

**Operating Factor:** 79.7%

**Energy Unavailability Factor:** 18.3%

**Total Off-line Time:** 1776 hours

[illegible]

UNIT 2 DEMONSTRATED STRONG PERFORMANCE IN THE THIRD AND FOURTH QUARTER OF THE YEAR. THE UNIT EXPERIENCED 4 GRID DISTURBANCES, WHICH CAUSE AUTOMATIC SCRAMS OF SHUTDOWN SYSTEM 2. THE UNIT ALSO INCURRED SIGNIFICANT FORCED LOSSES EARLY IN THE YEAR DUE TO A HYDROGEN LEAK FROM ON THE GENERATOR SYSTEM.

<b>Date of Construction Start:</b>	01 Dec 1970	<b>Lifetime Generation:</b>	87318.0 GW(e)-h
<b>Date of First Criticality:</b>	27 Jul 1976	<b>Cumulative Energy Availability Factor:</b>	62.8%
<b>Date of Grid Connection:</b>	04 Sep 1976	<b>Cumulative Load Factor:</b>	61.8%
<b>Date of Commercial Operation:</b>	01 Sep 1977	<b>Cumulative Unit Capability Factor:</b>	63.4%
		<b>Cumulative Energy Unavailability Factor:</b>	37.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	1696.8	740	87.0	87.0	87.0	87.0	80.3	80.3	2481	86.9
1978	3603.8	740	65.4	70.8	65.2	70.6	55.7	61.8	5946	68.1
1979	4408.8	740	73.8	72.1	73.8	72.0	67.3	64.2	6534	73.8
1980	6074.9	740	93.5	78.5	93.5	78.4	93.5	73.0	8463	96.3
1981	5795.1	740	89.6	81.1	89.6	81.0	89.4	76.8	7904	90.2
1982	4432.4	740	68.0	78.6	68.0	78.6	68.4	75.2	6163	70.4
1983	6112.8	740	89.5	80.3	89.5	80.3	94.3	78.2	7941	90.7
1984	6223.9	740	91.0	81.8	91.0	81.8	95.7	80.6	8649	98.5
1985	4979.3	781	77.9	81.3	73.5	80.7	72.8	79.6	6525	74.5
1986	4257.6	848	59.2	78.7	57.0	77.9	57.3	76.9	5308	60.6
1987	3781.4	848	52.2	75.8	50.6	74.9	50.9	74.1	4636	52.9
1988	4971.2	848	71.7	75.4	71.7	74.6	66.7	73.4	7741	88.1
1989	1316.3	848	17.8	70.3	17.7	69.6	17.7	68.5	2149	24.5
1990	2578.3	848	35.5	67.5	35.2	66.8	34.7	65.8	3460	39.5
1991	4483.5	848	63.2	67.2	60.3	66.3	60.4	65.4	5915	67.5
1992	353.9	848	4.7	62.8	4.7	62.0	4.8	61.1	625	7.1
1993	3016.8	848	40.8	61.4	40.8	60.6	40.6	59.8	6041	69.0
1994	3882.5	848	52.3	60.8	52.3	60.1	52.3	59.3	7046	80.4
1995	3791.0	848	66.4	61.1	66.4	60.4	66.4	59.6	6225	92.4
1996			Data not available - Long-term shutdown							

1997						"					
1998						"					
1999						"					
2000						"					
2001						"					
2002						"					
2003						"					
2004						"					
2005						"					
2006						"					
2007						"					
2008						"					
2009						"					
2010						"					
2011						"					
2012	1039.2	734	77.1	61.2	77.1	60.6	76.6	59.8	1826	98.8	
2013	5607.7	734	88.2	62.5	88.1	61.9	87.2	61.1	8190	93.5	
2014	4910.3	734	81.7	63.4	81.7	62.8	76.4	61.8	6984	79.7	

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1519			654	
D. Inspection, maintenance or repair without refuelling				568		
E. Testing of plant systems or components					1	
H. Nuclear regulatory requirements					7	
J. Grid limitation, failure or grid unavailability			252			12
L. Human factor related					17	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						10
Z. Other					23	
Subtotal	0	1519	252	568	702	22
Total		1771			1292	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		87
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		4
14. Safety Systems		6
15. Reactor Cooling Systems	181	90
16. Steam generation systems		335
21. Fuel Handling and Storage Facilities		20
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		4
35. All other I&C Systems		1
41. Main Generator Systems	1338	50
42. Electrical Power Supply Systems		17
XX. Miscellaneous Systems		9
Total	1519	648

## CA-10 BRUCE-3

Operator: BRUCEPOW (Bruce Power)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 730.0 MW(e)  
 Design Net Capacity: 750.0 MW(e)  
 Design Discharge Burnup: 8750 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 4125.0 GW(e)·h  
 Energy Availability Factor: 64.5%  
 Load Factor: 64.5%  
 Operating Factor: 65.3%  
 Energy Unavailability Factor: 35.5%  
 Total Off-line Time: 3042 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	479.0	495.8	549.5	116.8	0.0	0.0	0.0	434.7	528.9	454.8	522.0	543.5	4125.0
EAF (%)	87.7	100.0	100.0	23.0	0.0	0.0	0.0	79.8	100.0	86.4	100.0	100.0	64.5
UCF (%)	87.7	100.0	100.0	23.0	0.0	0.0	0.0	79.8	100.0	86.4	100.0	100.0	64.5
LF (%)	88.2	101.1	101.2	22.2	0.0	0.0	0.0	80.0	100.6	83.7	99.3	100.1	64.5
OF (%)	89.8	100.0	100.0	22.9	0.0	0.0	0.0	81.6	100.0	91.1	100.0	100.0	65.3
EUf (%)	12.3	0.0	0.0	77.0	100.0	100.0	100.0	20.2	0.0	13.6	0.0	0.0	35.5
PUf (%)	0.0	0.0	0.0	77.0	100.0	100.0	100.0	20.2	0.0	0.0	0.0	0.0	33.3
UCLF (%)	12.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.6	0.0	0.0	2.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT 3 DEMONSTRATED STRONG PERFORMANCE WITH A FLR OF 3.30% AND EXECUTION AN EXTENSIVE PLANNED OUTAGE, WHICH INCLUDED FUEL CHANNEL WORK, PHT PUMP-MOTOR REPLACEMENT, AND REPLACEMENT OF THE MAIN OUTPUT TRANSFORMER. TWO FORCED OUTAGES WERE INCURRED OVER THE YEAR.

### 5. Historical Summary

Date of Construction Start: 01 Jul 1972      Lifetime Generation: 143003.0 GW(e)·h  
 Date of First Criticality: 28 Nov 1977      Cumulative Energy Availability Factor: 73.0%  
 Date of Grid Connection: 12 Dec 1977      Cumulative Load Factor: 72.7%  
 Date of Commercial Operation: 01 Feb 1978      Cumulative Unit Capability Factor: 73.7%  
    Cumulative Energy Unavailability Factor: 27.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1978	4793.0	740	87.6	87.6	87.6	87.6	82.0	82.0	7361	93.2
1979	4797.9	740	77.8	82.4	77.8	82.4	73.2	77.4	6885	77.7
1980	5939.8	740	91.4	85.5	91.4	85.5	91.4	82.2	8276	94.2
1981	5795.0	740	89.5	86.5	89.5	86.5	89.4	84.0	7873	89.9
1982	6381.9	740	96.7	88.6	96.7	88.6	98.4	87.0	8497	97.0
1983	6091.1	740	89.2	88.7	89.2	88.7	94.0	88.1	7905	90.2
1984	6148.7	740	91.2	89.1	91.2	89.1	94.6	89.1	8077	92.0
1985	6015.1	775	93.9	89.7	88.6	89.0	88.6	89.0	8118	92.7
1986	5891.2	796	86.9	89.4	84.2	88.4	84.5	88.5	7600	86.8
1987	6073.3	848	85.8	89.0	81.9	87.7	81.8	87.7	7724	88.2
1988	3310.6	848	45.6	84.6	45.6	83.4	44.4	83.3	4044	46.0
1989	4031.7	848	57.4	82.1	54.8	80.8	54.3	80.7	5364	61.2
1990	5652.7	848	76.8	81.6	76.3	80.4	76.1	80.3	7472	85.3
1991	6126.3	848	84.3	81.8	82.4	80.6	82.5	80.5	7950	90.8
1992	5801.0	848	77.9	81.6	77.9	80.4	77.9	80.3	7438	84.7
1993	3158.2	848	43.0	79.0	43.0	77.9	42.5	77.7	6557	74.9
1994	2737.6	848	36.9	76.3	36.9	75.3	36.9	75.2	5006	57.1
1995	4225.8	848	56.9	75.2	56.9	74.2	56.9	74.1	7000	79.9
1996	3321.5	848	44.6	73.5	44.6	72.5	44.6	72.4	5684	64.7
1997	4214.8	848	56.8	72.6	56.8	71.7	56.7	71.6	6325	72.2
1998	1642.5	848	81.6	72.7	81.6	71.8	81.6	71.7	2328	98.1

1999	Data not available - Long-term shutdown									
2000	"									
2001	"									
2002	"									
2003	"									
2004	4971.6	750	76.5	72.9	76.1	72.0	75.3	71.9	7154	81.4
2005	4938.1	750	75.5	73.0	75.2	72.2	75.2	72.0	6782	77.4
2006	5440.2	750	83.3	73.4	82.9	72.6	82.8	72.5	7435	84.9
2007	4966.7	750	76.7	73.5	76.0	72.7	75.6	72.6	6911	78.9
2008	5148.9	734	79.8	73.8	79.3	73.0	79.9	72.9	7125	81.1
2009	5162.1	730	80.6	74.0	80.4	73.2	80.7	73.1	7148	81.6
2010	4375.8	730	69.6	73.8	68.4	73.1	68.4	73.0	6198	70.8
2011	5084.9	730	79.1	74.0	78.9	73.3	79.5	73.2	6959	79.4
2012	3352.1	730	52.3	73.3	52.2	72.6	52.3	72.5	4617	52.6
2013	5518.7	730	94.2	74.0	94.0	73.3	86.3	72.9	7914	90.3
2014	4125.0	730	64.5	73.7	64.5	73.0	64.5	72.7	5718	65.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1978 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		141			613	
C. Inspection, maintenance or repair combined with refuelling				21	0	
D. Inspection, maintenance or repair without refuelling				728		
E. Testing of plant systems or components				14	0	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	2899					
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						17
L. Human factor related					9	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						13
Z. Other					1	
Subtotal	2899	141	0	763	623	31
Total		3040			1417	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1978 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		72
12. Reactor I&C Systems		43
13. Reactor Auxiliary Systems		24
14. Safety Systems		62
15. Reactor Cooling Systems		64
16. Steam generation systems		102
21. Fuel Handling and Storage Facilities		27
31. Turbine and auxiliaries		94
32. Feedwater and Main Steam System		35
33. Circulating Water System	141	1
35. All other I&C Systems		5
41. Main Generator Systems		63
42. Electrical Power Supply Systems		11
XX. Miscellaneous Systems		5
Total	141	608

**Contractor:** OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 2. Production Summary 2014

<b>Net Energy Production:</b>	6027.8 GW(e)-h
<b>Energy Availability Factor:</b>	99.4%
<b>Load Factor:</b>	94.3%
<b>Operating Factor:</b>	94.1%
<b>Energy Unavailability Factor:</b>	0.6%
<b>Total Off-line Time:</b>	517 hours

[illegible]

UNIT 4 DEMONSTRATED STRONG PERFORMANCE THROUGHOUT THE YEAR, ACHIEVING A FORCED-LOSS RATE OF 0.69%, PLACING IT IN THE TOP DECILE OF WANO PLANTS. THE UNIT WAS BROUGHT DOWN IN LATE JUNE DUE TO A GRID DISTURBANCE, AND INCURRED FORCED LOSSES DUE TO CONDENSER LEAKS.

<b>Date of Construction Start:</b>	01 Sep 1972	<b>Lifetime Generation:</b>	140924.0 GW(e)-h
<b>Date of First Criticality:</b>	10 Dec 1978	<b>Cumulative Energy Availability Factor:</b>	73.0%
<b>Date of Grid Connection:</b>	21 Dec 1978	<b>Cumulative Load Factor:</b>	72.4%
<b>Date of Commercial Operation:</b>	18 Jan 1979	<b>Cumulative Unit Capability Factor:</b>	73.8%
		<b>Cumulative Energy Unavailability Factor:</b>	27.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979	4966.4	740	84.8	84.8	84.8	84.8	80.4	80.4	7084	84.8
1980	4945.1	740	76.1	80.4	76.1	80.4	76.1	78.2	6962	79.3
1981	5753.5	740	89.1	83.3	89.1	83.3	88.8	81.7	7874	89.9
1982	6050.2	740	92.2	85.6	92.2	85.6	93.3	84.7	8150	93.0
1983	6407.4	740	94.3	87.3	94.3	87.3	98.8	87.5	8345	95.3
1984	6664.6	740	97.8	89.1	97.8	89.1	102.5	90.1	8625	98.2
1985	4995.2	788	79.0	87.6	73.2	86.7	72.3	87.4	6518	74.4
1986	6891.6	848	95.5	88.7	92.8	87.5	92.8	88.1	8644	98.7
1987	5045.0	848	71.5	86.6	67.9	85.1	67.9	85.6	6366	72.7
1988	4663.7	848	66.9	84.4	65.7	83.0	62.6	83.1	5997	68.3
1989	5584.2	848	77.0	83.7	75.3	82.2	75.2	82.3	7290	83.2
1990	3533.0	848	48.3	80.5	47.5	79.1	47.6	79.2	4611	52.6
1991	5940.7	848	81.6	80.6	79.9	79.2	80.0	79.3	7955	90.8
1992	5843.4	848	80.1	80.6	78.4	79.1	78.4	79.2	8070	91.9
1993	350.1	848	4.7	75.2	4.7	73.9	4.7	73.9	527	6.0
1994	3656.0	848	49.3	73.5	49.3	72.2	49.2	72.3	7206	82.3
1995	3034.9	848	40.9	71.5	40.9	70.3	40.9	70.4	5024	57.4
1996	5296.3	848	71.2	71.4	71.2	70.3	71.1	70.4	8686	98.9
1997	2923.0	848	39.4	69.7	39.4	68.6	39.3	68.7	4968	56.7
1998	12.3	848	0.8	68.9	0.8	67.9	0.8	67.9	45	2.5
1999			Data not available - Long-term shutdown							

Data not available - Long-term shutdown

2000					"						
2001					"						
2002					"						
2003	934.5	769	100.0	69.3	100.0	68.3	55.0	67.8	802	36.3	
2004	5418.8	769	83.4	69.9	83.4	69.0	82.1	68.4	7469	85.0	
2005	5499.1	750	84.1	70.5	83.7	69.6	83.7	69.1	7469	85.3	
2006	5308.2	750	81.6	71.0	80.8	70.1	80.8	69.6	7261	82.9	
2007	5251.0	750	80.8	71.4	80.1	70.5	79.9	70.0	7298	83.3	
2008	5504.4	734	85.6	71.9	84.9	71.0	85.4	70.6	7603	86.6	
2009	4907.6	730	77.4	72.1	76.9	71.2	76.7	70.8	7014	80.1	
2010	5976.2	730	94.5	72.9	94.1	72.0	93.5	71.6	8360	95.4	
2011	6259.2	730	99.0	73.8	98.7	72.9	97.9	72.5	8670	99.0	
2012	3700.4	730	58.5	73.3	58.3	72.4	57.7	72.0	5137	58.5	
2013	4131.3	730	63.5	73.0	63.4	72.2	64.6	71.7	5778	66.0	
2014	6027.8	730	99.4	73.8	99.4	73.0	94.3	72.4	8243	94.1	

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1979 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					734	
C. Inspection, maintenance or repair combined with refuelling				63		
D. Inspection, maintenance or repair without refuelling				639		
E. Testing of plant systems or components				42		
H. Nuclear regulatory requirements					5	
J. Grid limitation, failure or grid unavailability			518			
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						1
L. Human factor related					7	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						13
Z. Other					11	2
Subtotal	0	0	518	744	757	17
Total		518			1518	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1979 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		94
12. Reactor I&C Systems		32
14. Safety Systems		35
15. Reactor Cooling Systems		60
16. Steam generation systems		168
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		19
31. Turbine and auxiliaries		55
32. Feedwater and Main Steam System		35
35. All other I&C Systems		96
41. Main Generator Systems		78
42. Electrical Power Supply Systems		22
XX. Miscellaneous Systems		33
Total	0	728

# CA-18 BRUCE-5

Operator: BRUCEPOW (Bruce Power)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 817.0 MW(e)  
 Design Net Capacity: 822.0 MW(e)  
 Design Discharge Burnup: 7710 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5859.1 GW(e)·h  
 Energy Availability Factor: 84.6%  
 Load Factor: 81.9%  
 Operating Factor: 85.5%  
 Energy Unavailability Factor: 15.4%  
 Total Off-line Time: 1273 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	603.9	549.5	610.0	588.0	593.9	567.6	603.1	573.7	500.8	45.5	47.6	575.6	5859.1
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0	99.6	8.7	8.9	100.0	84.6
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	8.7	8.9	100.0	84.8
LF (%)	99.3	100.1	100.4	100.0	97.7	96.5	99.2	94.4	85.1	7.5	8.1	94.7	81.9
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.6	13.5	100.0	85.5
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.4	91.3	91.1	0.0	15.4
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	91.3	84.9	0.0	14.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.4	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jun 1978      Lifetime Generation: 182053.0 GW(e)·h  
 Date of First Criticality: 15 Nov 1984      Cumulative Energy Availability Factor: 85.1%  
 Date of Grid Connection: 02 Dec 1984      Cumulative Load Factor: 84.7%  
 Date of Commercial Operation: 01 Mar 1985      Cumulative Unit Capability Factor: 85.7%  
    Cumulative Energy Unavailability Factor: 14.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	4992.2	805	91.6	91.6	85.9	85.9	84.2	84.2	6324	86.1
1986	7078.0	835	98.4	95.4	96.7	91.8	96.8	91.2	8675	99.0
1987	5730.1	835	80.2	90.0	78.2	87.0	78.3	86.6	7197	82.2
1988	6673.6	860	88.5	89.6	88.5	87.4	88.3	87.1	7824	89.1
1989	7130.8	860	97.1	91.2	94.1	88.8	94.7	88.7	8589	98.0
1990	5534.7	860	74.6	88.3	73.5	86.1	73.5	86.0	6656	76.0
1991	6769.6	860	90.7	88.6	90.3	86.8	89.9	86.6	8130	92.8
1992	6452.1	860	85.8	88.3	85.8	86.6	85.4	86.4	7636	86.9
1993	5118.3	860	68.1	86.0	68.1	84.5	67.9	84.3	7457	85.1
1994	5629.3	860	75.0	84.8	75.0	83.5	74.7	83.3	7671	87.6
1995	6125.3	860	81.4	84.5	81.4	83.3	81.3	83.1	7859	89.7
1996	5767.6	860	76.4	83.8	76.4	82.7	76.3	82.6	7153	81.4
1997	6388.3	860	84.8	83.9	84.8	82.9	84.8	82.7	8148	93.0
1998	5623.1	785	81.7	83.7	81.7	82.8	81.8	82.7	7305	83.4
1999	5281.9	785	76.6	83.3	76.6	82.4	76.8	82.3	6719	76.7
2000	6908.7	785	99.1	84.2	99.1	83.4	100.2	83.4	8719	99.3
2001	4902.1	790	70.9	83.5	70.9	82.7	70.8	82.7	6220	71.0
2002	5993.1	790	86.3	83.6	86.3	82.9	86.6	82.9	7630	87.1
2003	5302.5	790	77.3	83.3	77.3	82.6	76.6	82.6	6783	77.4
2004	5889.1	790	85.1	83.4	85.1	82.7	84.9	82.7	7543	85.9
2005	5109.6	790	74.6	83.0	74.1	82.3	73.8	82.3	6678	76.2
2006	6723.5	806	97.2	83.6	96.8	83.0	95.9	82.9	8694	99.2
2007	6710.9	795	97.7	84.2	97.2	83.6	96.4	83.4	8760	100.0
2008	5597.0	817	78.3	84.0	78.0	83.4	78.0	83.2	6943	79.0

2009	6826.7	817	98.0	84.5	97.9	83.9	95.4	83.7	8597	98.1
2010	6699.7	817	94.2	84.9	94.0	84.3	93.6	84.1	8368	95.5
2011	6149.8	817	86.9	85.0	86.8	84.4	85.9	84.1	7666	87.5
2012	6927.6	817	98.4	85.5	98.2	84.9	96.5	84.6	8690	98.9
2013	6421.8	817	92.1	85.7	92.0	85.2	89.7	84.8	8141	92.9
2014	5859.1	817	84.8	85.7	84.6	85.1	81.9	84.7	7487	85.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		39			241	
D. Inspection, maintenance or repair without refuelling	1246			678	7	
E. Testing of plant systems or components				6	0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						3
L. Human factor related					4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						15
Z. Other					1	
Subtotal	1246	39	0	684	253	19
Total		1285			956	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		27
13. Reactor Auxiliary Systems		10
14. Safety Systems		15
15. Reactor Cooling Systems		88
16. Steam generation systems		16
21. Fuel Handling and Storage Facilities		23
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System		22
33. Circulating Water System	39	1
41. Main Generator Systems		13
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems		2
Total	39	236



# CA-19 BRUCE-6

Operator: BRUCEPOW (Bruce Power)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 817.0 MW(e)  
 Design Net Capacity: 822.0 MW(e)  
 Design Discharge Burnup: 7710 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6768.6 GW(e)·h  
 Energy Availability Factor: 97.7%  
 Load Factor: 94.6%  
 Operating Factor: 96.9%  
 Energy Unavailability Factor: 2.3%  
 Total Off-line Time: 272 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	609.2	548.9	610.6	590.1	450.8	576.5	602.3	586.5	536.4	547.5	563.3	546.4	6768.6
EAF (%)	100.0	100.0	100.0	100.0	74.7	100.0	100.0	98.7	100.0	100.0	100.0	100.0	97.7
UCF (%)	100.0	100.0	100.0	100.0	74.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9
LF (%)	100.2	100.0	100.5	100.3	74.2	98.0	99.1	96.5	91.2	90.1	95.8	89.9	94.6
OF (%)	100.0	100.0	100.0	100.0	73.9	100.0	100.0	100.0	100.0	100.0	100.0	89.5	96.9
EUf (%)	0.0	0.0	0.0	0.0	25.3	0.0	0.0	1.3	0.0	0.0	0.0	0.0	2.3
PUf (%)	0.0	0.0	0.0	0.0	25.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jan 1978      Lifetime Generation: 178745.0 GW(e)·h  
 Date of First Criticality: 29 May 1984      Cumulative Energy Availability Factor: 82.4%  
 Date of Grid Connection: 26 Jun 1984      Cumulative Load Factor: 81.8%  
 Date of Commercial Operation: 14 Sep 1984      Cumulative Unit Capability Factor: 83.1%  
    Cumulative Energy Unavailability Factor: 17.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	2301.0	822	99.4	99.4	98.8	98.8	98.9	98.9	2926	99.9
1985	5900.1	805	88.7	91.3	84.0	87.7	83.7	87.4	7369	84.1
1986	5716.0	835	81.7	87.1	77.8	83.4	78.1	83.4	7213	82.3
1987	7017.1	837	97.9	90.4	95.3	87.0	95.7	87.1	8610	98.3
1988	6139.5	837	89.2	90.1	89.1	87.5	83.5	86.3	7880	89.7
1989	5386.2	837	78.9	88.0	73.4	84.8	73.5	83.8	7069	80.7
1990	6213.6	852	83.9	87.3	82.3	84.4	83.2	83.7	7429	84.8
1991	7013.4	860	93.3	88.2	93.0	85.6	93.1	85.1	8194	93.5
1992	5328.2	860	70.5	86.0	70.5	83.8	70.5	83.3	6393	72.8
1993	4351.0	860	58.0	82.9	58.0	81.0	57.8	80.5	6950	79.3
1994	6451.7	860	85.7	83.2	85.7	81.4	85.6	81.0	8760	100.0
1995	4671.6	860	62.1	81.3	62.1	79.7	62.0	79.3	6049	69.1
1996	6822.8	860	90.4	82.1	90.4	80.6	90.3	80.2	8682	98.8
1997	4796.4	860	63.7	80.7	63.7	79.3	63.7	78.9	6201	70.8
1998	4678.6	785	68.1	79.9	68.0	78.6	68.0	78.2	6137	70.1
1999	6860.1	785	99.4	81.0	99.3	79.8	99.8	79.5	8760	100.0
2000	4668.2	785	66.8	80.2	66.8	79.1	67.7	78.9	5912	67.3
2001	6840.1	790	98.3	81.2	98.3	80.1	98.8	79.9	8624	98.4
2002	3522.5	790	50.6	79.6	50.6	78.6	50.9	78.4	4539	51.8
2003	6750.9	790	98.2	80.5	98.2	79.6	97.6	79.4	8559	97.7
2004	5379.1	790	76.6	80.4	76.6	79.4	75.4	79.2	6698	76.3
2005	5721.1	841	79.6	80.3	79.6	79.4	78.9	79.2	7151	81.6
2006	7104.4	822	99.4	81.2	99.3	80.3	98.7	80.0	8760	100.0
2007	5145.0	822	71.8	80.8	71.8	79.9	71.5	79.7	6363	72.6

2008	6857.3	817	95.5	81.4	95.4	80.6	95.6	80.3	8452	96.2
2009	6063.1	817	91.4	81.8	91.3	81.0	84.7	80.5	7732	88.3
2010	5471.9	817	76.7	81.6	76.5	80.8	76.5	80.3	6815	77.8
2011	6552.5	817	94.1	82.0	94.0	81.3	91.6	80.8	8277	94.5
2012	7125.3	817	99.7	82.6	99.6	81.9	99.3	81.4	8784	100.0
2013	5684.0	817	81.1	82.6	81.0	81.9	79.4	81.3	7174	81.9
2014	6768.6	817	97.9	83.1	97.7	82.4	94.6	81.8	8488	96.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					399	
C. Inspection, maintenance or repair combined with refuelling				41		
D. Inspection, maintenance or repair without refuelling	194			723	4	
E. Testing of plant systems or components				0	2	
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			78			15
L. Human factor related					19	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						13
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					13	
Z. Other					15	
Subtotal	194	0	78	764	452	31
Total		272			1247	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		85
12. Reactor I&C Systems		40
14. Safety Systems		23
15. Reactor Cooling Systems		104
16. Steam generation systems		65
21. Fuel Handling and Storage Facilities		9
31. Turbine and auxiliaries		12
32. Feedwater and Main Steam System		16
33. Circulating Water System		7
35. All other I&C Systems		7
41. Main Generator Systems		3
42. Electrical Power Supply Systems		23
Total	0	394

## CA-20 BRUCE-7

Operator: BRUCEPOW (Bruce Power)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 817.0 MW(e)  
 Design Net Capacity: 822.0 MW(e)  
 Design Discharge Burnup: 7710 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5479.2 GW(e)·h  
 Energy Availability Factor: 80.7%  
 Load Factor: 76.6%  
 Operating Factor: 81.2%  
 Energy Unavailability Factor: 19.3%  
 Total Off-line Time: 1647 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	608.4	183.9	0.0	234.4	579.5	561.2	590.7	574.9	527.5	545.5	558.5	514.7	5479.2
EAF (%)	100.0	34.4	0.3	40.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0	80.7
UCF (%)	100.0	34.4	0.3	40.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0	80.7
LF (%)	100.1	33.5	0.0	39.8	95.3	95.4	97.2	94.6	89.7	89.7	94.9	84.7	76.6
OF (%)	100.0	35.6	0.0	45.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.9	81.2
EUf (%)	0.0	65.6	99.7	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	19.3
PUf (%)	0.0	65.6	99.7	21.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.3
UCLF (%)	0.0	0.0	0.0	38.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	4.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 May 1979      Lifetime Generation: 175469.0 GW(e)·h  
 Date of First Criticality: 07 Jan 1986      Cumulative Energy Availability Factor: 85.5%  
 Date of Grid Connection: 22 Feb 1986      Cumulative Load Factor: 84.6%  
 Date of Commercial Operation: 10 Apr 1986      Cumulative Unit Capability Factor: 86.3%  
    Cumulative Energy Unavailability Factor: 14.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	4952.8	838	96.7	96.7	89.8	89.8	89.7	89.7	6438	97.5
1987	6288.1	837	96.9	96.8	85.9	87.6	85.8	87.4	8489	96.9
1988	4866.2	846	74.8	88.7	74.8	82.9	65.4	79.4	6636	75.5
1989	7280.8	860	97.8	91.2	96.4	86.6	96.6	84.0	8632	98.5
1990	6659.4	860	90.7	91.1	88.5	87.0	88.4	85.0	8065	92.1
1991	5733.6	860	76.4	88.5	76.3	85.1	76.1	83.4	6835	78.0
1992	6413.4	860	85.2	88.0	85.1	85.1	84.9	83.6	7589	86.4
1993	5802.3	860	78.1	86.7	78.1	84.2	77.0	82.8	8760	100.0
1994	5496.7	860	73.2	85.2	73.2	82.9	73.0	81.7	7577	86.5
1995	6285.1	860	83.5	85.0	83.5	83.0	83.4	81.8	8092	92.4
1996	5475.7	860	72.6	83.8	72.5	82.0	72.5	81.0	7000	79.7
1997	6154.5	860	81.7	83.6	81.7	82.0	81.7	81.0	7874	89.9
1998	4990.8	785	72.4	82.8	72.4	81.3	72.6	80.4	6474	73.9
1999	6315.7	785	92.3	83.5	91.8	82.0	91.8	81.2	8208	93.7
2000	5322.7	785	78.2	83.1	76.9	81.7	77.2	80.9	6790	77.3
2001	7026.3	790	100.0	84.1	100.0	82.8	101.5	82.2	8760	100.0
2002	4819.4	790	69.5	83.3	69.5	82.0	69.6	81.5	6121	69.9
2003	6730.2	790	97.7	84.1	97.7	82.9	97.3	82.3	8592	98.1
2004	6428.8	790	92.8	84.5	92.8	83.4	92.6	82.8	8188	93.2
2005	4890.5	790	70.2	83.8	70.2	82.7	70.1	82.2	6310	72.0
2006	6740.5	806	95.1	84.4	94.8	83.3	94.4	82.8	8486	96.9
2007	6969.9	822	97.3	85.0	97.1	83.9	96.8	83.4	8570	97.8
2008	5763.7	817	80.1	84.7	79.9	83.7	80.3	83.3	7101	80.8
2009	6475.3	817	97.9	85.3	97.9	84.3	90.5	83.6	8144	93.0

2010	6726.6	817	93.8	85.6	93.7	84.7	94.0	84.0	8610	98.3
2011	5761.5	817	80.8	85.4	80.7	84.6	80.5	83.9	7137	81.5
2012	7056.0	817	99.7	86.0	99.5	85.1	98.3	84.4	8731	99.4
2013	7003.6	817	99.5	86.5	99.4	85.6	97.9	84.9	8758	100.0
2014	5479.2	817	80.7	86.3	80.7	85.5	76.6	84.6	7113	81.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		349			239	
D. Inspection, maintenance or repair without refuelling	1296			602	9	
E. Testing of plant systems or components				9		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						20
L. Human factor related					4	
Z. Other					11	3
Subtotal	1296	349	0	611	263	23
Total		1645			897	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		31
13. Reactor Auxiliary Systems		2
14. Safety Systems	74	1
15. Reactor Cooling Systems		48
16. Steam generation systems		19
21. Fuel Handling and Storage Facilities		32
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System	275	26
41. Main Generator Systems		7
42. Electrical Power Supply Systems		19
XX. Miscellaneous Systems		36
Total	349	233

## CA-21 BRUCE-8

Operator: BRUCEPOW (Bruce Power)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 817.0 MW(e)  
 Design Net Capacity: 795.0 MW(e)  
 Design Discharge Burnup: 7710 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6873.5 GW(e)·h  
 Energy Availability Factor: 99.9%  
 Load Factor: 96.0%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.1%  
 Total Off-line Time: 0 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	603.8	553.6	612.1	586.9	577.9	579.5	595.7	592.5	530.0	542.4	534.7	564.3	6873.5
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	98.5	100.0	100.0	100.0	100.0	100.0	99.9
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	98.5	100.0	100.0	100.0	100.0	100.0	99.9
LF (%)	99.3	100.8	100.7	99.8	95.1	98.5	98.0	97.5	90.1	89.2	90.9	92.8	96.0
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.1
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Aug 1979      Lifetime Generation: 163860.0 GW(e)·h  
 Date of First Criticality: 15 Feb 1987      Cumulative Energy Availability Factor: 83.7%  
 Date of Grid Connection: 09 Mar 1987      Cumulative Load Factor: 82.9%  
 Date of Commercial Operation: 22 May 1987      Cumulative Unit Capability Factor: 84.8%  
    Cumulative Energy Unavailability Factor: 16.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	3673.2	844	95.7	95.7	74.7	74.7	74.6	74.6	5849	99.5
1988	5958.5	837	86.8	90.4	86.5	81.8	81.0	78.5	7659	87.2
1989	6523.5	837	98.4	93.4	89.2	84.6	89.0	82.4	8661	98.9
1990	5758.7	842	80.7	89.9	78.1	82.8	78.0	81.2	7186	82.0
1991	6932.7	860	93.0	90.6	92.5	84.9	92.0	83.6	8213	93.8
1992	5451.1	860	72.4	87.3	72.4	82.7	72.2	81.5	6587	75.0
1993	4675.9	860	62.3	83.5	62.3	79.6	62.1	78.6	7064	80.6
1994	6443.2	860	86.0	83.8	86.0	80.4	85.5	79.5	8760	100.0
1995	6113.4	860	81.3	83.6	81.3	80.5	81.1	79.7	7876	89.9
1996	6957.8	860	92.1	84.5	92.1	81.7	92.1	81.0	8783	100.0
1997	6346.5	860	84.2	84.4	84.2	82.0	84.2	81.3	8003	91.4
1998	4122.4	785	59.9	82.5	59.8	80.2	59.9	79.6	5368	61.3
1999	4114.4	785	60.0	80.8	59.8	78.7	59.8	78.1	5414	61.8
2000	6530.9	785	93.7	81.7	93.7	79.7	94.7	79.3	8293	94.4
2001	5424.8	790	78.0	81.5	78.0	79.6	78.4	79.2	6852	78.2
2002	6686.0	790	97.0	82.4	97.0	80.7	96.6	80.3	8543	97.5
2003	4960.0	790	71.9	81.8	71.9	80.2	71.7	79.8	6301	71.9
2004	5695.8	790	83.0	81.9	82.8	80.3	82.1	79.9	7374	83.9
2005	6889.2	790	99.7	82.8	99.4	81.3	99.5	80.9	8745	99.8
2006	5283.9	790	76.6	82.5	76.4	81.1	76.3	80.7	6791	77.5
2007	6485.3	795	94.0	83.0	93.4	81.6	93.1	81.3	8341	95.2
2008	6514.4	782	94.5	83.5	94.3	82.2	94.8	81.9	8699	99.0
2009	5266.4	782	80.6	83.4	80.6	82.1	76.9	81.7	6906	78.8
2010	6930.2	817	98.8	84.0	98.6	82.8	98.9	82.4	8760	100.0

2011	6453.4	817	91.4	84.3	91.4	83.2	90.2	82.7	8015	91.5
2012	5682.7	817	85.6	84.4	85.5	83.2	79.2	82.5	7161	81.5
2013	5656.6	817	80.6	84.3	80.6	83.1	79.0	82.4	7141	81.5
2014	6873.5	817	99.9	84.8	99.9	83.7	96.0	82.9	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					312	
C. Inspection, maintenance or repair combined with refuelling				43		
D. Inspection, maintenance or repair without refuelling				658	35	
E. Testing of plant systems or components				0	1	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						27
L. Human factor related					6	
Z. Other					1	
Subtotal	0	0	0	701	355	27
Total	0			1083		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		8
14. Safety Systems		20
15. Reactor Cooling Systems		63
16. Steam generation systems		134
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		13
33. Circulating Water System		5
35. All other I&C Systems		4
41. Main Generator Systems		1
42. Electrical Power Supply Systems		20
XX. Miscellaneous Systems		3
Total	0	307

# CA-22 DARLINGTON-1

Operator: OPG (Ontario Power Generation)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 878.0 MW(e)  
 Design Net Capacity: 881.0 MW(e)  
 Design Discharge Burnup: 8625 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5818.6 GW(e)·h  
 Energy Availability Factor: 75.9%  
 Load Factor: 75.7%  
 Operating Factor: 78.2%  
 Energy Unavailability Factor: 24.1%  
 Total Off-line Time: 1912 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	644.1	583.8	647.6	60.3	0.0	138.0	640.4	584.2	613.1	645.3	614.3	647.4	5818.6
EAF (%)	99.0	99.3	99.8	9.6	0.0	21.8	98.1	89.4	97.1	99.0	97.3	99.5	75.9
UCF (%)	99.0	100.0	100.0	9.7	0.0	21.8	98.9	91.9	100.0	99.8	97.3	99.5	76.5
LF (%)	98.6	98.9	99.1	9.5	0.0	21.8	98.0	89.4	97.0	98.8	97.2	99.1	75.7
OF (%)	100.0	100.0	100.0	10.0	0.0	34.7	100.0	93.3	100.0	100.0	100.0	100.0	78.2
EUf (%)	1.0	0.7	0.2	90.4	100.0	78.2	1.9	10.6	2.9	1.0	2.7	0.5	24.1
PUf (%)	1.0	0.0	0.0	90.4	100.0	60.9	0.0	8.1	0.0	0.2	0.0	0.4	21.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	17.3	1.1	0.0	0.0	0.0	2.7	0.1	1.7
XUF (%)	0.0	0.7	0.2	0.0	0.0	0.0	0.8	2.4	2.9	0.8	0.0	0.0	0.7

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Apr 1982      Lifetime Generation: 149148.0 GW(e)·h  
 Date of First Criticality: 29 Oct 1990      Cumulative Energy Availability Factor: 85.0%  
 Date of Grid Connection: 19 Dec 1990      Cumulative Load Factor: 84.5%  
 Date of Commercial Operation: 14 Nov 1992      Cumulative Unit Capability Factor: 86.0%  
    Cumulative Energy Unavailability Factor: 15.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1992	974.0	881	96.8	96.8	96.8	96.8	75.5	75.5	1152	78.7
1993	6016.2	881	79.2	81.7	78.7	81.3	78.0	77.6	7213	82.3
1994	6326.6	881	83.5	82.5	83.1	82.2	82.0	79.6	7446	85.0
1995	6853.3	881	90.7	85.1	89.7	84.5	88.8	82.5	8046	91.8
1996	5745.3	881	75.7	82.8	75.0	82.3	74.2	80.5	6827	77.7
1997	4765.1	881	63.0	79.0	62.3	78.4	61.7	76.9	7236	82.6
1998	6427.5	881	84.3	79.9	83.3	79.2	83.3	77.9	7717	88.1
1999	7175.1	881	94.4	81.9	93.0	81.1	93.0	80.0	8705	99.4
2000	6280.6	881	82.0	81.9	81.2	81.1	81.2	80.2	7615	86.7
2001	6980.8	881	91.2	82.9	90.5	82.1	90.5	81.3	8502	97.1
2002	6532.9	881	85.5	83.2	84.7	82.4	84.6	81.6	7887	90.0
2003	6562.4	881	87.5	83.5	85.1	82.6	85.0	81.9	7846	89.6
2004	5612.1	881	73.6	82.7	72.8	81.8	72.5	81.2	6540	74.5
2005	7366.3	881	97.0	83.8	96.2	82.9	95.7	82.3	8553	97.6
2006	6388.9	878	85.2	83.9	83.4	82.9	83.1	82.3	7520	85.8
2007	7412.6	878	98.2	84.8	96.8	83.9	96.4	83.2	8647	98.7
2008	6125.3	878	80.8	84.6	79.7	83.6	79.4	83.0	7125	81.1
2009	6870.2	878	91.0	85.0	89.8	84.0	89.3	83.4	8038	91.8
2010	7244.9	878	95.5	85.5	94.5	84.5	94.2	84.0	8660	98.9
2011	6256.8	878	82.7	85.4	81.6	84.4	81.3	83.8	7313	83.5
2012	7256.4	878	95.5	85.9	94.3	84.9	94.1	84.3	8468	96.4
2013	7454.0	878	98.4	86.5	97.1	85.5	96.9	84.9	8760	100.0
2014	5818.6	878	76.5	86.0	75.9	85.0	75.7	84.5	6848	78.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1991 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		57			435	
D. Inspection, maintenance or repair without refuelling	1856			575		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				44		
J. Grid limitation, failure or grid unavailability						3
Z. Other					1	
Subtotal	1856	57	0	619	436	3
Total		1913			1058	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1991 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		31
13. Reactor Auxiliary Systems		4
14. Safety Systems		16
15. Reactor Cooling Systems		222
21. Fuel Handling and Storage Facilities		30
31. Turbine and auxiliaries	57	12
32. Feedwater and Main Steam System		1
35. All other I&C Systems		27
41. Main Generator Systems		57
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems		7
Total	57	429



## CA-23 DARLINGTON-2

Operator: OPG (Ontario Power Generation)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 878.0 MW(e)  
 Design Net Capacity: 881.0 MW(e)  
 Design Discharge Burnup: 8625 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7412.5 GW(e)·h  
 Energy Availability Factor: 96.4%  
 Load Factor: 96.4%  
 Operating Factor: 97.3%  
 Energy Unavailability Factor: 3.6%  
 Total Off-line Time: 238 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	579.0	491.5	654.1	635.0	654.9	626.7	647.4	573.2	617.9	648.2	630.1	654.5	7412.5
EAF (%)	89.0	83.2	100.0	100.0	100.0	99.4	99.3	87.9	97.8	99.5	99.6	100.0	96.4
UCF (%)	89.0	83.2	100.0	100.0	100.0	100.0	100.0	90.2	100.0	100.0	99.6	100.0	96.9
LF (%)	88.6	83.3	100.1	100.5	100.3	99.1	99.1	87.7	97.7	99.2	99.7	100.2	96.4
OF (%)	91.1	84.4	100.0	100.0	100.0	100.0	100.0	91.0	100.0	100.0	100.0	100.0	97.3
EUUF (%)	11.0	16.8	0.0	0.0	0.0	0.6	0.7	12.1	2.2	0.5	0.4	0.0	3.6
PUF (%)	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
UCLF (%)	0.5	16.8	0.0	0.0	0.0	0.0	0.0	9.8	0.0	0.0	0.4	0.0	2.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.6	0.7	2.3	2.2	0.5	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Sep 1981      Lifetime Generation: 149196.0 GW(e)·h  
 Date of First Criticality: 05 Nov 1989      Cumulative Energy Availability Factor: 79.2%  
 Date of Grid Connection: 15 Jan 1990      Cumulative Load Factor: 78.9%  
 Date of Commercial Operation: 09 Oct 1990      Cumulative Unit Capability Factor: 80.1%  
    Cumulative Energy Unavailability Factor: 20.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1990	1153.5	881	64.9	64.9	64.9	64.9	65.7	65.7	1608	80.7
1991	51.5	881	0.7	12.6	0.7	12.6	0.7	12.7	102	1.2
1992	1290.2	881	16.7	14.4	16.7	14.4	16.7	14.5	2418	27.5
1993	6370.2	881	83.3	35.7	82.7	35.6	82.5	35.6	7594	86.7
1994	6750.8	881	88.9	48.3	88.5	48.1	87.5	47.8	8069	92.1
1995	6953.0	881	91.3	56.5	90.7	56.2	90.1	55.9	8104	92.5
1996	6705.7	881	87.8	61.6	87.2	61.2	86.7	60.9	7752	88.3
1997	4710.4	881	61.7	61.6	61.5	61.3	61.0	60.9	7069	80.7
1998	6227.9	881	81.9	64.0	80.7	63.6	80.7	63.3	7492	85.5
1999	6469.1	881	85.1	66.3	83.8	65.8	83.8	65.5	7824	89.3
2000	6885.4	881	90.1	68.7	89.0	68.1	89.0	67.8	8221	93.6
2001	5826.4	881	76.3	69.3	75.5	68.7	75.5	68.5	7030	80.3
2002	7268.9	881	95.4	71.5	94.2	70.8	94.2	70.6	8627	98.5
2003	6084.1	881	81.6	72.2	79.3	71.5	78.8	71.2	7245	82.7
2004	7038.4	881	96.7	74.0	91.4	72.9	91.0	72.6	8737	99.5
2005	6056.2	878	79.7	74.3	78.9	73.3	78.7	73.0	7031	80.3
2006	7548.4	878	99.4	75.9	98.6	74.8	98.1	74.5	8745	99.8
2007	6364.8	878	83.4	76.3	82.9	75.3	82.8	75.0	7327	83.6
2008	7560.9	878	98.8	77.5	98.2	76.5	98.0	76.3	8696	99.0
2009	6745.3	878	88.4	78.1	87.7	77.1	87.7	76.9	7769	88.7
2010	6234.3	878	82.5	78.3	81.1	77.3	81.1	77.1	7248	82.7
2011	7503.5	878	98.9	79.3	97.7	78.3	97.6	78.0	8719	99.5
2012	7158.0	878	93.9	79.9	93.0	78.9	92.8	78.7	8467	96.4
2013	5138.8	878	67.3	79.4	67.0	78.4	66.8	78.2	6131	70.0

2014	7412.5	878	96.9	80.1	96.4	79.2	96.4	78.9	8522	97.3
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## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		173			588	
D. Inspection, maintenance or repair without refuelling	66			555	13	
J. Grid limitation, failure or grid unavailability						3
Z. Other					262	
Subtotal	66	173	0	555	863	3
Total		239			1421	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		31
12. Reactor I&C Systems		33
13. Reactor Auxiliary Systems		1
14. Safety Systems		9
15. Reactor Cooling Systems	106	379
16. Steam generation systems		49
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		18
31. Turbine and auxiliaries		20
32. Feedwater and Main Steam System		10
35. All other I&C Systems		13
41. Main Generator Systems		7
42. Electrical Power Supply Systems	67	5
XX. Miscellaneous Systems		6
Total	173	582

## CA-24 DARLINGTON-3

Operator: OPG (Ontario Power Generation)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 878.0 MW(e)  
 Design Net Capacity: 881.0 MW(e)  
 Design Discharge Burnup: 8625 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7501.6 GW(e)·h  
 Energy Availability Factor: 97.7%  
 Load Factor: 97.5%  
 Operating Factor: 99.4%  
 Energy Unavailability Factor: 2.3%  
 Total Off-line Time: 52 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	569.1	586.6	648.4	628.7	648.8	623.0	642.7	632.8	612.1	643.9	622.4	643.1	7501.6
EAF (%)	87.2	99.2	99.4	99.8	99.7	99.0	98.5	97.0	96.9	99.5	98.4	98.4	97.7
UCF (%)	87.2	99.2	99.9	100.0	99.9	100.0	100.0	100.0	100.0	100.0	99.6	99.5	98.7
LF (%)	87.1	99.4	99.3	99.5	99.3	98.5	98.4	96.9	96.8	98.6	98.4	98.4	97.5
OF (%)	93.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4
EUf (%)	12.8	0.8	0.6	0.2	0.3	1.0	1.5	3.0	3.1	0.5	1.6	1.6	2.3
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
UCLF (%)	12.9	0.8	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.3	1.2
XUF (%)	0.0	0.0	0.5	0.2	0.2	1.0	1.4	3.0	3.1	0.5	1.1	1.0	1.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Sep 1984      Lifetime Generation: 147038.0 GW(e)·h  
 Date of First Criticality: 09 Nov 1992      Cumulative Energy Availability Factor: 87.2%  
 Date of Grid Connection: 07 Dec 1992      Cumulative Load Factor: 86.8%  
 Date of Commercial Operation: 14 Feb 1993      Cumulative Unit Capability Factor: 88.1%  
    Cumulative Energy Unavailability Factor: 12.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1993	6003.4	881	89.8	89.8	89.2	89.2	85.0	85.0	7141	89.1
1994	6528.5	881	85.6	87.6	85.3	87.2	84.6	84.8	7642	87.2
1995	7061.5	881	92.9	89.5	92.2	88.9	91.5	87.1	8219	93.8
1996	7391.6	881	97.3	91.5	96.7	90.9	95.5	89.2	8574	97.6
1997	4010.8	881	52.4	83.5	52.1	83.0	52.0	81.7	6314	72.1
1998	7244.9	881	94.7	85.4	93.9	84.8	93.9	83.7	8593	98.1
1999	5629.1	881	75.1	83.9	72.9	83.1	72.9	82.2	6929	79.1
2000	6517.0	881	85.1	84.1	84.2	83.3	84.2	82.4	7822	89.0
2001	6578.0	881	86.3	84.3	85.2	83.5	85.2	82.7	7901	90.2
2002	6371.8	881	83.7	84.2	82.6	83.4	82.6	82.7	7595	86.7
2003	6827.2	881	89.5	84.7	88.6	83.9	88.5	83.3	8004	91.4
2004	6601.6	881	86.9	84.9	85.6	84.0	85.3	83.4	7649	87.1
2005	7562.0	878	99.1	86.0	98.3	85.1	98.2	84.6	8760	100.0
2006	5573.1	878	73.1	85.1	72.5	84.2	72.5	83.7	6452	73.7
2007	7221.1	878	94.8	85.7	93.9	84.9	93.9	84.4	8311	94.9
2008	7654.6	878	99.9	86.6	99.2	85.8	99.3	85.3	8784	100.0
2009	5657.2	878	74.5	85.9	73.6	85.0	73.6	84.6	6590	75.2
2010	7500.9	878	98.5	86.6	97.5	85.7	97.5	85.3	8643	98.7
2011	7558.6	878	99.2	87.3	98.4	86.4	98.3	86.0	8707	99.4
2012	6377.6	878	84.0	87.1	83.0	86.2	82.7	85.9	7419	84.5
2013	7334.6	878	96.6	87.6	95.6	86.7	95.4	86.3	8470	96.7
2014	7501.6	878	98.7	88.1	97.7	87.2	97.5	86.8	8708	99.4

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1993 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		52			245	
D. Inspection, maintenance or repair without refuelling				581		
E. Testing of plant systems or components					6	
L. Human factor related					4	
Subtotal	0	52	0	581	255	0
Total		52			836	

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1993 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		18
13. Reactor Auxiliary Systems		12
14. Safety Systems		3
15. Reactor Cooling Systems		54
16. Steam generation systems		17
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		24
31. Turbine and auxiliaries		58
32. Feedwater and Main Steam System	52	16
35. All other I&C Systems		24
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems		4
Total	52	239

## CA-25 DARLINGTON-4

Operator: OPG (Ontario Power Generation)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 878.0 MW(e)  
 Design Net Capacity: 881.0 MW(e)  
 Design Discharge Burnup: 8625 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7302.7 GW(e)·h  
 Energy Availability Factor: 95.2%  
 Load Factor: 94.9%  
 Operating Factor: 96.8%  
 Energy Unavailability Factor: 4.8%  
 Total Off-line Time: 284 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	651.0	587.6	604.7	630.2	647.0	618.9	646.1	633.6	612.4	646.4	631.3	393.7	7302.7
EAF (%)	100.0	100.0	93.2	100.0	99.8	98.4	98.9	97.1	97.0	99.4	99.6	60.4	95.2
UCF (%)	100.0	100.0	93.2	100.0	99.8	99.5	100.0	100.0	100.0	100.0	99.6	60.4	96.0
LF (%)	99.7	99.6	92.6	99.7	99.0	97.9	98.9	97.0	96.9	99.0	99.9	60.3	94.9
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	61.8	96.8
EUUF (%)	0.0	0.0	6.8	0.0	0.2	1.6	1.1	2.9	3.0	0.6	0.4	39.6	4.8
PUF (%)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	39.6	3.4
UCLF (%)	0.0	0.0	6.8	0.0	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	1.1	1.0	2.9	3.0	0.6	0.0	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Jul 1985      Lifetime Generation: 143381.0 GW(e)·h  
 Date of First Criticality: 13 Mar 1993      Cumulative Energy Availability Factor: 86.0%  
 Date of Grid Connection: 17 Apr 1993      Cumulative Load Factor: 85.7%  
 Date of Commercial Operation: 14 Jun 1993      Cumulative Unit Capability Factor: 86.7%  
    Cumulative Energy Unavailability Factor: 14.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1993	3057.8	881	74.0	74.0	73.9	73.9	67.6	67.6	3616	70.4
1994	7038.7	881	92.2	85.5	91.8	85.2	91.2	82.5	8143	93.0
1995	6750.6	881	88.1	86.5	87.7	86.2	87.5	84.4	7751	88.5
1996	6105.4	881	79.4	84.5	79.1	84.2	78.9	82.9	7023	80.0
1997	5069.6	881	66.0	80.5	65.7	80.2	65.7	79.1	7428	84.8
1998	6520.9	881	85.3	81.3	84.5	81.0	84.5	80.1	7699	87.9
1999	6216.1	881	81.6	81.4	80.5	80.9	80.5	80.2	7431	84.8
2000	6975.0	881	90.8	82.6	90.1	82.1	90.1	81.5	8219	93.6
2001	6836.3	881	89.6	83.4	88.6	82.9	88.6	82.3	8037	91.7
2002	7449.8	881	97.3	84.9	96.5	84.3	96.5	83.8	8760	100.0
2003	5428.9	881	72.3	83.7	70.6	83.0	70.3	82.5	6320	72.1
2004	7321.1	881	95.2	84.7	94.6	84.0	94.6	83.6	8451	96.2
2005	6569.7	878	86.5	84.8	85.6	84.1	85.3	83.7	7617	87.0
2006	7449.4	878	97.1	85.7	96.5	85.0	96.9	84.7	8541	97.5
2007	6210.2	878	81.4	85.4	80.8	84.7	80.7	84.4	7170	81.8
2008	7525.5	878	98.4	86.3	97.3	85.6	97.6	85.2	8652	98.5
2009	6836.1	878	89.7	86.5	88.7	85.7	88.9	85.5	7892	90.1
2010	5633.7	878	73.6	85.7	73.3	85.0	73.2	84.8	6612	75.5
2011	7617.8	878	99.7	86.5	98.9	85.8	99.0	85.5	8760	100.0
2012	7557.7	878	99.0	87.1	97.9	86.4	98.0	86.2	8725	99.3
2013	5237.4	878	68.8	86.2	68.3	85.5	68.1	85.3	6132	70.0
2014	7302.7	878	96.0	86.7	95.2	86.0	94.9	85.7	8476	96.8

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1993 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					323	
D. Inspection, maintenance or repair without refuelling	283			608		
E. Testing of plant systems or components				15	2	
J. Grid limitation, failure or grid unavailability						4
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other					12	
Subtotal	283	0	0	623	337	5
Total	283			965		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1993 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		47
13. Reactor Auxiliary Systems		9
14. Safety Systems		15
15. Reactor Cooling Systems		103
16. Steam generation systems		3
21. Fuel Handling and Storage Facilities		20
31. Turbine and auxiliaries		28
32. Feedwater and Main Steam System		10
33. Circulating Water System		7
41. Main Generator Systems		24
42. Electrical Power Supply Systems		34
XX. Miscellaneous Systems		13
Total	0	319

# CA-4 PICKERING-1

Operator: OPG (Ontario Power Generation)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 515.0 MW(e)  
 Design Net Capacity: 508.0 MW(e)  
 Design Discharge Burnup: 9080 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 3871.3 GW(e)·h  
 Energy Availability Factor: 86.1%  
 Load Factor: 85.8%  
 Operating Factor: 89.7%  
 Energy Unavailability Factor: 13.9%  
 Total Off-line Time: 905 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	172.5	304.8	374.7	345.9	95.4	367.9	379.1	352.9	353.4	375.1	369.1	380.5	3871.3
EAF (%)	45.0	88.4	98.2	94.0	25.0	99.7	99.2	92.1	95.5	98.1	100.0	99.5	86.1
UCF (%)	49.2	98.9	98.2	94.0	25.0	99.9	99.3	92.9	96.1	98.3	100.0	99.5	87.4
LF (%)	45.0	88.1	97.8	93.3	24.9	99.2	98.9	92.1	95.3	97.9	99.5	99.3	85.8
OF (%)	56.0	92.1	100.0	95.1	34.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.7
EUf (%)	55.0	11.6	1.8	6.0	75.0	0.3	0.8	7.9	4.5	1.9	0.0	0.5	13.9
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.1	0.1
UCLF (%)	50.8	1.1	1.8	6.0	75.0	0.1	0.7	7.1	3.4	1.7	0.0	0.4	12.5
XUF (%)	4.1	10.5	0.0	0.0	0.0	0.3	0.1	0.8	0.6	0.2	0.0	0.0	1.3

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jun 1966      Lifetime Generation: 103402.0 GW(e)·h  
 Date of First Criticality: 25 Feb 1971      Cumulative Energy Availability Factor: 66.3%  
 Date of Grid Connection: 04 Apr 1971      Cumulative Load Factor: 63.8%  
 Date of Commercial Operation: 29 Jul 1971      Cumulative Unit Capability Factor: 66.5%  
    Cumulative Energy Unavailability Factor: 33.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1971	1921.7	514	100.0	100.0	100.0	100.0	84.7	84.7	3546	80.3
1972	2207.9	514	100.0	100.0	100.0	100.0	48.9	60.9	4117	46.9
1973	4222.4	514	94.0	97.6	94.0	97.6	92.3	73.5	8523	95.7
1974	3232.0	514	71.9	90.3	71.9	90.3	72.0	73.1	6979	79.9
1975	3592.8	512	80.2	88.1	80.2	88.1	80.3	74.7	7234	82.8
1976	4169.7	514	92.7	88.9	92.7	88.9	92.6	77.9	8136	92.9
1977	3852.8	514	85.8	88.4	85.8	88.4	85.8	79.1	7545	86.4
1978	4273.7	515	95.1	89.3	95.1	89.3	95.0	81.2	8359	95.7
1979	3781.4	515	85.3	88.8	85.3	88.8	82.9	81.4	7554	85.3
1980	3356.9	515	73.7	87.2	73.7	87.2	74.2	80.7	6640	75.6
1981	3947.7	515	88.0	87.3	88.0	87.3	87.5	81.3	7795	89.0
1982	3499.3	515	77.8	86.5	77.8	86.5	77.6	81.0	6915	78.9
1983	3070.8	515	68.1	85.0	68.1	85.0	68.1	80.0	6101	69.6
1984	0.0	515	0.0	78.7	0.0	78.7	0.0	74.0	0	0.0
1985	0.0	515	0.0	73.3	0.0	73.3	0.0	68.9	0	0.0
1986	0.0	515	0.0	68.6	0.0	68.6	0.0	64.5	0	0.0
1987	832.8	515	19.7	65.6	17.4	65.5	18.5	61.7	1981	22.6
1988	3986.5	515	89.2	67.0	89.1	66.8	88.1	63.2	8224	93.6
1989	3222.1	515	72.7	67.3	72.6	67.1	71.4	63.7	6943	79.3
1990	3041.7	515	70.9	67.5	70.6	67.3	67.4	63.8	7435	84.9
1991	3051.1	515	67.8	67.5	67.8	67.3	67.6	64.0	6525	74.5
1992	2920.0	515	65.4	67.4	65.4	67.2	64.5	64.1	5798	66.0
1993	3451.2	515	78.4	67.9	78.4	67.7	76.5	64.6	6908	78.9
1994	897.6	515	20.1	65.8	20.1	65.7	19.9	62.7	1835	20.9

1995	2013.2	515	45.7	65.0	44.8	64.9	44.6	62.0	4234	48.3
1996	3011.8	515	66.8	65.1	66.8	64.9	66.6	62.2	6202	70.6
1997	3950.8	515	89.7	66.0	89.7	65.9	88.5	63.1	8205	94.7
1998	Data not available - Long-term shutdown									
1999	"									
2000	"									
2001	"									
2002	"									
2003	"									
2004	"									
2005	585.0	515	96.9	66.4	96.9	66.3	38.8	62.8	1230	42.0
2006	3470.5	515	77.2	66.8	77.0	66.6	76.9	63.3	7260	82.9
2007	1750.3	515	38.9	65.8	38.9	65.7	38.8	62.5	3447	39.3
2008	2792.1	515	61.8	65.7	61.7	65.5	61.7	62.5	6221	70.8
2009	4108.8	515	91.4	66.5	91.1	66.4	91.1	63.4	8436	96.3
2010	2376.1	515	52.9	66.1	52.7	65.9	52.7	63.1	4983	56.9
2011	3669.2	515	81.8	66.6	81.5	66.4	81.3	63.6	7382	84.3
2012	2912.4	515	65.1	66.5	64.5	66.4	64.4	63.6	5799	66.0
2013	2075.0	515	46.2	65.9	46.0	65.8	46.0	63.1	4344	49.6
2014	3871.3	515	87.4	66.5	86.1	66.3	85.8	63.8	7855	89.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		823			1516	
D. Inspection, maintenance or repair without refuelling				602		
E. Testing of plant systems or components				4	5	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					52	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			82			
P. Fire					32	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						68
Z. Other					10	
Subtotal	0	823	82	606	1615	69
Total		905			2290	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		812
12. Reactor I&C Systems	416	54
13. Reactor Auxiliary Systems	108	53
14. Safety Systems		56
15. Reactor Cooling Systems		133
16. Steam generation systems		57
21. Fuel Handling and Storage Facilities	297	61
31. Turbine and auxiliaries		71
32. Feedwater and Main Steam System		46
35. All other I&C Systems		2
41. Main Generator Systems		47
42. Electrical Power Supply Systems		110
XX. Miscellaneous Systems		7
Total	821	1509



## CA-7 PICKERING-4

Operator: OPG (Ontario Power Generation)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 515.0 MW(e)  
 Design Net Capacity: 508.0 MW(e)  
 Design Discharge Burnup: 9080 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 2853.5 GW(e)·h  
 Energy Availability Factor: 63.3%  
 Load Factor: 63.3%  
 Operating Factor: 65.9%  
 Energy Unavailability Factor: 36.7%  
 Total Off-line Time: 2988 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	47.1	0.0	0.0	0.0	330.2	363.3	348.9	368.6	362.0	323.1	332.1	378.2	2853.5
EAF (%)	12.3	0.0	0.0	0.0	85.8	98.1	90.9	96.3	98.3	84.4	89.6	98.8	63.3
UCF (%)	12.3	0.0	0.0	0.0	85.8	98.4	91.0	97.6	98.8	84.6	89.6	98.8	63.5
LF (%)	12.3	0.0	0.0	0.0	86.2	98.0	91.1	96.2	97.6	84.3	89.6	98.7	63.3
OF (%)	12.6	0.0	0.0	0.0	88.7	100.0	100.0	100.0	100.0	89.1	94.9	100.0	65.9
EUf (%)	87.7	100.0	100.0	100.0	14.2	1.9	9.1	3.7	1.7	15.6	10.4	1.2	36.7
PUf (%)	87.4	100.0	97.5	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.5
UCLF (%)	0.4	0.0	2.5	100.0	12.5	1.6	9.0	2.4	1.2	15.4	10.4	1.2	13.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.2	0.1	1.3	0.5	0.2	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 May 1968      Lifetime Generation: 106895.0 GW(e)·h  
 Date of First Criticality: 16 May 1973      Cumulative Energy Availability Factor: 66.0%  
 Date of Grid Connection: 21 May 1973      Cumulative Load Factor: 65.9%  
 Date of Commercial Operation: 17 Jun 1973      Cumulative Unit Capability Factor: 66.4%  
 Cumulative Energy Unavailability Factor: 34.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	2226.6	514	90.5	90.5	90.5	90.5	90.2	90.2	4402	91.7
1974	4221.0	514	94.0	92.8	94.0	92.8	94.0	92.7	8356	95.7
1975	1094.2	513	24.2	65.9	24.2	65.9	24.4	65.9	2201	25.2
1976	3089.0	514	68.2	66.6	68.2	66.6	68.6	66.7	6063	69.2
1977	4107.2	514	90.3	71.8	90.3	71.8	91.5	72.1	7975	91.3
1978	4033.9	515	89.7	75.0	89.7	75.0	89.7	75.3	7876	90.2
1979	4102.2	515	91.0	77.5	91.0	77.5	89.9	77.6	8059	91.0
1980	3700.5	515	81.8	78.1	81.8	78.1	81.8	78.1	7321	83.3
1981	4142.0	515	91.7	79.6	91.7	79.6	91.8	79.7	8078	92.2
1982	4137.9	515	91.8	80.9	91.8	80.9	91.7	81.0	8087	92.3
1983	4170.2	515	92.3	82.0	92.3	82.0	92.4	82.1	8183	93.4
1984	3733.3	515	82.7	82.1	82.7	82.1	82.5	82.1	7425	84.5
1985	3438.9	515	83.5	82.2	77.5	81.7	76.2	81.6	6824	77.9
1986	3687.4	515	83.2	82.3	83.2	81.8	81.7	81.6	7410	84.6
1987	3770.4	515	84.3	82.4	84.0	82.0	83.6	81.8	7495	85.6
1988	3166.2	515	70.1	81.6	70.1	81.2	70.0	81.0	6525	74.3
1989	2255.5	515	50.0	79.7	50.0	79.3	50.0	79.1	5468	62.4
1990	1070.8	515	23.7	76.5	23.7	76.1	23.7	76.0	2851	32.5
1991	2130.8	515	47.3	74.9	47.3	74.6	47.2	74.4	5185	59.2
1992	0.0	515	0.0	71.1	0.0	70.8	0.0	70.6	0	0.0
1993	3309.6	515	74.2	71.2	73.8	70.9	73.4	70.8	6711	76.6
1994	4009.6	515	89.7	72.1	89.5	71.8	88.9	71.6	7915	90.4
1995	2807.0	515	63.8	71.7	63.3	71.4	62.2	71.2	5684	64.9
1996	1134.9	515	25.1	69.7	25.1	69.4	25.1	69.2	2230	25.4

1997	0.0	515	0.0	66.9	0.0	66.6	0.0	66.4	0	0.0
1998	Data not provided									
1999	Data not available - Long-term shutdown									
2000	"									
2001	"									
2002	"									
2003	844.8	515	69.7	66.9	69.7	66.6	69.7	66.4	1880	79.9
2004	3266.8	515	75.6	67.3	72.1	66.8	72.2	66.7	6739	76.7
2005	2996.5	515	66.5	67.2	66.4	66.8	66.4	66.6	5900	67.4
2006	2976.5	515	66.3	67.2	66.0	66.8	66.0	66.6	6149	70.2
2007	1959.1	515	43.4	66.4	43.4	66.0	43.4	65.8	4086	46.6
2008	3656.4	515	80.9	66.9	80.8	66.5	80.8	66.3	7765	88.4
2009	1620.2	515	36.1	65.9	35.9	65.5	35.9	65.3	3845	43.9
2010	3203.5	515	71.4	66.0	71.1	65.7	71.0	65.5	6583	75.1
2011	2401.1	515	53.7	65.7	53.3	65.3	53.2	65.1	4919	56.2
2012	3310.8	515	73.7	65.9	73.4	65.5	73.2	65.4	6592	75.0
2013	3884.5	515	86.6	66.5	86.3	66.1	86.1	66.0	7798	89.0
2014	2853.5	515	63.5	66.4	63.3	66.0	63.3	65.9	5772	65.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1973 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		941			1081	
D. Inspection, maintenance or repair without refuelling	2047			1086		
E. Testing of plant systems or components				53		
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					3	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						12
Z. Other					6	
Subtotal	2047	941	0	1139	1090	16
Total		2988			2245	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1973 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		53
12. Reactor I&C Systems	117	132
13. Reactor Auxiliary Systems		150
14. Safety Systems		12
15. Reactor Cooling Systems	84	427
16. Steam generation systems	738	21
21. Fuel Handling and Storage Facilities		9
31. Turbine and auxiliaries		93
32. Feedwater and Main Steam System		22
35. All other I&C Systems		4
41. Main Generator Systems		45
42. Electrical Power Supply Systems		106
XX. Miscellaneous Systems		1
Total	939	1075

# CA-13 PICKERING-5

Operator: OPG (Ontario Power Generation)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 516.0 MW(e)  
 Design Net Capacity: 516.0 MW(e)  
 Design Discharge Burnup: 8330 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4255.1 GW(e)·h  
 Energy Availability Factor: 94.6%  
 Load Factor: 94.1%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 5.4%  
 Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	373.2	325.8	366.8	358.7	377.4	364.1	367.2	315.8	335.7	369.7	348.2	352.6	4255.1
EAF (%)	98.1	94.0	95.6	96.8	99.4	98.8	96.0	82.3	90.4	96.4	94.8	92.5	94.6
UCF (%)	99.3	94.2	95.6	97.9	99.6	99.3	97.2	84.7	92.2	96.9	94.8	92.5	95.4
LF (%)	97.2	94.0	95.6	96.5	98.3	98.0	95.7	82.3	90.4	96.3	93.7	91.8	94.1
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	1.9	6.0	4.4	3.2	0.6	1.2	4.0	17.7	9.6	3.6	5.2	7.5	5.4
PUf (%)	0.0	0.0	0.0	0.0	0.2	0.0	0.4	0.7	0.0	0.0	0.0	0.5	0.2
UCLF (%)	0.7	5.8	4.4	2.1	0.2	0.7	2.4	14.5	7.8	3.1	5.2	7.1	4.5
XUF (%)	1.2	0.2	0.0	1.1	0.2	0.6	1.3	2.5	1.8	0.5	0.0	0.0	0.8

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Nov 1974      Lifetime Generation: 105623.0 GW(e)·h  
 Date of First Criticality: 23 Oct 1982      Cumulative Energy Availability Factor: 73.7%  
 Date of Grid Connection: 19 Dec 1982      Cumulative Load Factor: 73.4%  
 Date of Commercial Operation: 10 May 1983      Cumulative Unit Capability Factor: 74.3%  
    Cumulative Energy Unavailability Factor: 26.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	2719.9	516	90.3	90.3	90.3	90.3	89.6	89.6	5446	92.6
1984	3517.5	516	77.8	82.8	77.8	82.8	77.6	82.4	7035	80.1
1985	3366.5	516	83.1	82.9	77.7	80.9	74.5	79.5	6989	79.8
1986	4068.6	516	91.2	85.1	90.7	83.6	90.0	82.3	8057	92.0
1987	3600.1	516	80.3	84.1	79.6	82.7	79.6	81.8	7148	81.6
1988	4397.2	516	97.5	86.5	97.5	85.3	97.0	84.5	8683	98.9
1989	3400.8	516	75.7	84.9	75.4	83.8	75.2	83.1	6862	78.3
1990	3885.0	516	86.4	85.1	86.4	84.2	85.9	83.4	7821	89.3
1991	2887.1	516	64.6	82.7	64.4	81.9	63.9	81.2	5724	65.3
1992	1345.2	516	29.8	77.2	29.8	76.5	29.7	75.9	2621	29.8
1993	3841.8	516	85.6	78.0	85.4	77.3	85.0	76.7	8307	94.8
1994	3074.4	516	68.5	77.2	68.5	76.6	68.0	76.0	6196	70.7
1995	3372.9	516	75.0	77.0	74.8	76.4	74.6	75.9	7008	80.0
1996	3042.6	516	67.1	76.3	67.1	75.7	67.1	75.2	6429	73.2
1997	3924.9	516	86.8	77.0	86.8	76.5	86.8	76.0	7908	90.3
1998	3490.6	516	77.2	77.0	77.2	76.5	77.2	76.1	7296	83.3
1999	2511.6	516	55.6	75.7	55.6	75.3	55.6	74.9	5302	60.5
2000	2631.5	516	58.1	74.7	58.0	74.3	58.1	73.9	5457	62.1
2001	2980.2	516	66.6	74.3	65.9	73.9	65.9	73.5	5986	68.3
2002	2655.7	516	59.2	73.5	58.8	73.1	58.8	72.7	5565	63.5
2003	3295.0	516	71.1	73.4	69.1	72.9	72.9	72.7	6566	75.0
2004	4159.8	516	92.6	74.3	92.2	73.8	91.8	73.6	8264	94.1
2005	2352.8	516	53.6	73.4	52.6	72.9	52.1	72.7	4818	55.0
2006	4010.9	516	89.7	74.1	88.9	73.5	88.7	73.3	8113	92.6

2007	2567.6	516	57.5	73.4	57.0	72.9	56.8	72.7	5637	64.3
2008	4026.8	516	89.8	74.0	88.9	73.5	88.8	73.3	8357	95.1
2009	3140.9	516	70.1	73.9	69.6	73.3	69.5	73.2	6631	75.7
2010	3769.8	516	84.1	74.3	83.7	73.7	83.4	73.5	7645	87.3
2011	1973.5	516	44.8	73.2	43.9	72.7	43.7	72.5	4258	48.6
2012	4347.3	516	98.2	74.1	96.3	73.5	95.9	73.3	8725	99.3
2013	2603.2	516	58.6	73.6	58.1	73.0	57.6	72.8	5371	61.3
2014	4255.1	516	95.4	74.3	94.6	73.7	94.1	73.4	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					865	
D. Inspection, maintenance or repair without refuelling				927		
E. Testing of plant systems or components				0	1	
L. Human factor related					57	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						17
Z. Other				29	22	
Subtotal	0	0	0	956	945	21
Total	0			1922		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		49
12. Reactor I&C Systems		71
13. Reactor Auxiliary Systems		59
14. Safety Systems		19
15. Reactor Cooling Systems		116
16. Steam generation systems		299
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System		9
33. Circulating Water System		5
35. All other I&C Systems		8
41. Main Generator Systems		88
42. Electrical Power Supply Systems		93
Total	0	859

# CA-14 PICKERING-6

Operator: OPG (Ontario Power Generation)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 516.0 MW(e)  
 Design Net Capacity: 516.0 MW(e)  
 Design Discharge Burnup: 8330 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 3979.3 GW(e)·h  
 Energy Availability Factor: 87.9%  
 Load Factor: 88.0%  
 Operating Factor: 95.9%  
 Energy Unavailability Factor: 12.1%  
 Total Off-line Time: 363 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	261.5	271.5	378.4	374.1	385.7	368.3	371.2	272.1	358.2	382.8	366.6	189.0	3979.3
EAF (%)	68.1	78.3	98.2	100.0	99.9	99.3	96.6	70.9	96.7	99.9	98.1	49.3	87.9
UCF (%)	69.0	78.5	98.2	100.0	99.9	99.4	96.7	71.9	97.6	100.0	98.1	49.3	88.2
LF (%)	68.1	78.3	98.6	100.7	100.5	99.1	96.7	70.9	96.4	99.7	98.7	49.2	88.0
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.2	53.0	95.9
EUf (%)	31.9	21.7	1.8	0.0	0.1	0.7	3.4	29.1	3.3	0.1	1.9	50.7	12.1
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	31.0	21.5	1.8	0.0	0.1	0.6	3.4	28.2	2.4	0.0	1.9	50.7	11.8
XUF (%)	0.9	0.2	0.0	0.0	0.0	0.1	0.1	1.0	0.9	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Oct 1975      Lifetime Generation: 109405.0 GW(e)·h  
 Date of First Criticality: 15 Oct 1983      Cumulative Energy Availability Factor: 77.9%  
 Date of Grid Connection: 08 Nov 1983      Cumulative Load Factor: 77.9%  
 Date of Commercial Operation: 01 Feb 1984      Cumulative Unit Capability Factor: 78.6%  
    Cumulative Energy Unavailability Factor: 22.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	3562.9	516	86.1	86.1	86.1	86.1	85.9	85.9	7048	87.7
1985	3289.1	516	79.5	82.6	73.1	79.3	72.8	79.0	6540	74.7
1986	3395.2	516	76.1	80.4	75.8	78.1	75.1	77.7	6763	77.2
1987	3949.9	516	88.5	82.5	86.6	80.3	87.4	80.2	7791	88.9
1988	4496.8	516	98.5	85.7	98.4	84.0	99.2	84.0	8775	99.9
1989	3950.2	516	87.9	86.1	87.6	84.6	87.4	84.6	7794	89.0
1990	3473.5	516	77.7	84.9	76.9	83.5	76.8	83.5	7017	80.1
1991	4469.7	516	99.2	86.7	99.0	85.4	98.9	85.4	8721	99.6
1992	4050.5	516	89.3	87.0	89.3	85.9	89.4	85.9	7936	90.3
1993	2689.2	516	60.4	84.3	59.9	83.3	59.5	83.2	5506	62.9
1994	4043.0	516	90.2	84.8	90.1	83.9	89.4	83.8	8036	91.7
1995	3493.3	516	77.5	84.2	77.2	83.3	77.3	83.2	6962	79.5
1996	2591.7	516	57.2	82.1	57.2	81.3	57.2	81.2	5707	65.0
1997	3386.2	516	74.9	81.6	74.9	80.8	74.9	80.8	6841	78.1
1998	3130.1	516	69.7	80.8	69.2	80.1	69.2	80.0	6384	72.9
1999	3353.7	516	74.4	80.4	74.2	79.7	74.2	79.6	6863	78.3
2000	2738.7	516	60.6	79.2	60.5	78.5	60.4	78.5	6449	73.4
2001	2618.1	516	57.7	78.0	57.7	77.4	57.9	77.3	5286	60.3
2002	3982.3	516	88.9	78.6	88.3	78.0	88.1	77.9	7985	91.2
2003	3267.4	516	74.3	78.4	72.5	77.7	72.3	77.6	6566	75.0
2004	2780.8	516	61.7	77.6	61.5	76.9	61.4	76.9	5597	63.7
2005	2850.1	516	64.3	77.0	63.1	76.3	63.1	76.2	5596	63.9
2006	3899.5	516	86.1	77.4	86.0	76.7	86.3	76.7	7635	87.2
2007	3216.5	516	71.3	77.1	70.8	76.5	71.2	76.4	6588	75.2

2008	4323.8	516	95.8	77.9	95.6	77.2	95.4	77.2	8521	97.0
2009	3493.2	516	78.0	77.9	77.6	77.2	77.3	77.2	7051	80.5
2010	3865.3	516	86.0	78.2	85.8	77.6	85.5	77.5	7659	87.4
2011	3195.8	516	71.3	77.9	71.0	77.3	70.7	77.3	6334	72.3
2012	4333.6	516	97.1	78.6	95.5	78.0	95.6	77.9	8550	97.3
2013	3027.4	516	67.4	78.2	67.2	77.6	67.0	77.5	6047	69.0
2014	3979.3	516	88.2	78.6	87.9	77.9	88.0	77.9	8397	95.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		364			553	
D. Inspection, maintenance or repair without refuelling				989		
E. Testing of plant systems or components				0	3	
J. Grid limitation, failure or grid unavailability						19
L. Human factor related					41	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						19
Z. Other					2	
Subtotal	0	364	0	989	599	41
Total		364			1629	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		53
12. Reactor I&C Systems		45
13. Reactor Auxiliary Systems		33
14. Safety Systems		43
15. Reactor Cooling Systems	364	42
16. Steam generation systems		112
21. Fuel Handling and Storage Facilities		15
31. Turbine and auxiliaries		54
32. Feedwater and Main Steam System		39
33. Circulating Water System		5
35. All other I&C Systems		5
41. Main Generator Systems		67
42. Electrical Power Supply Systems		12
XX. Miscellaneous Systems		22
Total	364	547

# CA-15 PICKERING-7

Operator: OPG (Ontario Power Generation)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 516.0 MW(e)  
 Design Net Capacity: 516.0 MW(e)  
 Design Discharge Burnup: 8330 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 2783.1 GW(e)·h  
 Energy Availability Factor: 62.0%  
 Load Factor: 61.6%  
 Operating Factor: 62.7%  
 Energy Unavailability Factor: 38.0%  
 Total Off-line Time: 3271 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	377.2	149.1	379.4	369.5	381.7	366.6	378.7	376.4	4.6	0.0	0.0	0.0	2783.1
EAF (%)	98.3	43.2	99.9	100.0	100.0	99.5	99.5	98.4	1.2	0.0	0.0	0.0	62.0
UCF (%)	98.9	43.2	100.0	100.0	100.0	99.8	100.0	99.7	1.2	0.0	0.0	0.0	62.2
LF (%)	98.3	43.0	98.8	99.5	99.4	98.7	98.6	98.1	1.2	0.0	0.0	0.0	61.6
OF (%)	100.0	46.7	100.0	100.0	100.0	100.0	100.0	100.0	2.1	0.0	0.0	0.0	62.7
EUf (%)	1.7	56.8	0.1	0.0	0.0	0.5	0.5	1.6	98.8	100.0	100.0	100.0	38.0
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	98.8	100.0	100.0	75.9	31.3
UCLF (%)	1.1	56.8	0.1	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	24.1	6.5
XUF (%)	0.6	0.0	0.0	0.0	0.0	0.3	0.5	1.3	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Mar 1976      Lifetime Generation: 105076.0 GW(e)·h  
 Date of First Criticality: 22 Oct 1984      Cumulative Energy Availability Factor: 77.5%  
 Date of Grid Connection: 17 Nov 1984      Cumulative Load Factor: 77.2%  
 Date of Commercial Operation: 01 Jan 1985      Cumulative Unit Capability Factor: 78.1%  
    Cumulative Energy Unavailability Factor: 22.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	4094.0	516	99.0	99.0	92.6	92.6	90.6	90.6	8277	94.5
1986	3373.3	516	75.5	87.2	75.2	83.9	74.6	82.6	7002	79.9
1987	4339.9	516	97.4	90.6	96.0	87.9	96.0	87.1	8642	98.7
1988	4340.4	516	95.9	92.0	95.4	89.8	95.8	89.2	8519	97.0
1989	3408.7	516	77.1	89.0	75.4	86.9	75.4	86.5	6939	79.2
1990	3500.8	516	78.4	87.2	77.7	85.4	77.4	85.0	7420	84.7
1991	4258.8	516	94.9	88.3	94.5	86.7	94.2	86.3	8436	96.3
1992	3727.4	516	82.4	87.6	82.4	86.2	82.2	85.8	7349	83.7
1993	4415.9	516	99.9	89.0	99.0	87.6	97.7	87.1	8760	100.0
1994	3709.9	516	83.4	88.4	83.4	87.2	82.1	86.6	7386	84.3
1995	4056.8	516	90.4	88.6	90.0	87.4	89.7	86.9	8140	92.9
1996	2050.7	516	45.4	85.0	45.4	83.9	45.2	83.4	4416	50.3
1997	2936.2	516	65.0	83.4	65.0	82.5	65.0	82.0	6208	70.9
1998	3084.7	516	68.9	82.4	68.2	81.4	68.2	81.0	6495	74.1
1999	4433.8	516	98.8	83.5	98.0	82.5	98.1	82.2	8751	99.9
2000	2099.0	516	46.4	81.2	46.3	80.3	46.3	79.9	4445	50.6
2001	4020.8	516	89.0	81.6	88.7	80.8	89.0	80.4	7968	91.0
2002	4246.9	516	94.4	82.3	93.9	81.5	94.0	81.2	8538	97.5
2003	1790.7	516	39.8	80.1	39.7	79.3	39.6	79.0	3811	43.5
2004	3116.1	516	68.9	79.5	68.9	78.8	68.7	78.5	6127	69.8
2005	4390.8	516	97.8	80.4	97.4	79.7	97.1	79.4	8658	98.8
2006	2652.6	516	59.1	79.4	59.1	78.7	58.7	78.4	5311	60.6
2007	3667.9	516	82.0	79.6	81.7	78.9	81.1	78.6	7540	86.1
2008	1530.3	516	34.0	77.7	34.0	77.0	33.8	76.7	3084	35.1

2009	4229.5	516	94.5	78.3	94.1	77.7	93.6	77.4	8492	96.9
2010	2920.7	516	65.1	77.8	64.8	77.2	64.6	76.9	5895	67.3
2011	4337.7	516	96.8	78.5	96.6	77.9	96.0	77.6	8673	99.0
2012	2920.0	516	66.3	78.1	64.8	77.4	64.4	77.1	5965	67.9
2013	4264.6	516	94.9	78.7	94.4	78.0	94.3	77.7	8760	100.0
2014	2783.1	516	62.2	78.1	62.0	77.5	61.6	77.2	5489	62.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		537			559	
D. Inspection, maintenance or repair without refuelling	2733			795		
E. Testing of plant systems or components				1	9	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					136	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						15
Z. Other					38	
Subtotal	2733	537	0	796	742	18
Total		3270			1556	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		92
12. Reactor I&C Systems		35
13. Reactor Auxiliary Systems		16
14. Safety Systems		37
15. Reactor Cooling Systems	537	83
16. Steam generation systems		45
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		25
32. Feedwater and Main Steam System		21
33. Circulating Water System		11
41. Main Generator Systems		78
42. Electrical Power Supply Systems		56
XX. Miscellaneous Systems		52
Total	537	553



# CA-16 PICKERING-8

Operator: OPG (Ontario Power Generation)

Contractor: OH/AECL (ONTARIO HYDRO / ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 516.0 MW(e)  
 Design Net Capacity: 516.0 MW(e)  
 Design Discharge Burnup: 8330 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 2411.3 GW(e)·h  
 Energy Availability Factor: 53.3%  
 Load Factor: 53.3%  
 Operating Factor: 59.6%  
 Energy Unavailability Factor: 46.7%  
 Total Off-line Time: 3537 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	376.8	192.3	0.0	0.0	41.6	308.1	58.6	20.1	338.9	382.3	330.0	362.6	2411.3
EAF (%)	98.1	55.7	0.0	0.0	10.8	82.8	15.3	5.2	91.3	99.1	88.9	94.2	53.3
UCF (%)	98.4	55.8	0.0	0.0	10.8	83.2	15.4	5.2	92.1	99.1	88.9	94.2	53.4
LF (%)	98.2	55.4	0.0	0.0	10.8	82.9	15.3	5.2	91.2	99.6	88.8	94.4	53.3
OF (%)	100.0	57.3	0.0	0.0	14.9	100.0	41.8	11.6	100.0	100.0	91.4	100.0	59.6
EUf (%)	1.9	44.3	100.0	100.0	89.2	17.2	84.7	94.8	8.7	0.9	11.1	5.8	46.7
PUf (%)	0.0	44.2	100.0	100.0	45.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.9
UCLF (%)	1.6	0.1	0.0	0.0	44.0	16.8	84.6	94.8	7.9	0.9	11.1	5.8	22.6
XUF (%)	0.3	0.1	0.0	0.0	0.0	0.4	0.1	0.0	0.8	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Sep 1976      Lifetime Generation: 98519.0 GW(e)·h  
 Date of First Criticality: 17 Dec 1985      Cumulative Energy Availability Factor: 75.5%  
 Date of Grid Connection: 21 Jan 1986      Cumulative Load Factor: 75.3%  
 Date of Commercial Operation: 28 Feb 1986      Cumulative Unit Capability Factor: 76.1%  
    Cumulative Energy Unavailability Factor: 24.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	3771.0	516	92.2	92.2	91.9	91.9	91.2	91.2	7846	97.9
1987	3759.4	516	84.7	88.3	83.3	87.4	83.2	87.0	7585	86.6
1988	3710.4	516	82.5	86.3	82.3	85.6	81.9	85.2	7296	83.1
1989	4295.2	516	96.6	88.9	95.4	88.1	95.0	87.7	8569	97.8
1990	3014.7	516	66.7	84.4	66.6	83.7	66.7	83.5	6743	77.0
1991	4485.0	516	99.5	87.0	98.9	86.3	99.2	86.1	8759	100.0
1992	4212.0	516	93.0	87.8	92.9	87.3	92.9	87.1	8280	94.3
1993	3670.5	516	82.1	87.1	81.7	86.6	81.2	86.4	7233	82.6
1994	4341.9	516	96.8	88.2	96.8	87.7	96.1	87.4	8579	97.9
1995	4012.1	516	89.4	88.3	89.0	87.9	88.8	87.6	8066	92.1
1996	1300.3	516	28.7	82.9	28.7	82.4	28.7	82.2	2597	29.6
1997	360.8	516	8.0	76.6	8.0	76.2	8.0	75.9	995	11.3
1998	3493.6	516	78.0	76.7	77.3	76.3	77.3	76.0	7009	80.0
1999	3509.1	516	78.4	76.8	77.6	76.4	77.6	76.2	7077	80.8
2000	2711.2	516	60.8	75.7	59.9	75.2	59.8	75.1	5508	62.7
2001	3502.2	516	78.2	75.9	77.5	75.4	77.5	75.2	6999	79.9
2002	3605.4	516	81.1	76.2	80.0	75.7	79.8	75.5	7244	82.7
2003	3921.3	516	89.7	76.9	86.9	76.3	86.8	76.1	8026	91.6
2004	2489.5	516	55.4	75.8	55.1	75.2	54.9	75.0	5182	59.0
2005	4195.2	516	94.6	76.7	93.4	76.1	92.8	75.9	8431	96.2
2006	2908.5	516	65.1	76.2	64.8	75.5	64.3	75.3	5853	66.8
2007	3843.2	516	87.3	76.7	85.5	76.0	85.0	75.8	8015	91.5
2008	2918.7	516	64.7	76.2	64.4	75.5	64.4	75.3	6116	69.6
2009	4115.2	516	91.6	76.8	91.0	76.1	91.0	75.9	8520	97.3

2010	3081.1	516	68.5	76.5	68.2	75.8	68.2	75.6	6427	73.4
2011	4051.7	516	90.3	77.0	89.6	76.4	89.6	76.2	8345	95.3
2012	2936.4	516	65.5	76.6	64.9	75.9	64.8	75.7	5967	67.9
2013	3879.1	516	86.3	76.9	86.0	76.3	85.8	76.1	7979	91.1
2014	2411.3	516	53.4	76.1	53.3	75.5	53.3	75.3	5223	59.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1480			451	
D. Inspection, maintenance or repair without refuelling	2056			874		
E. Testing of plant systems or components				0		
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					364	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						7
Z. Other					1	
Subtotal	2056	1480	0	874	816	11
Total		3536			1701	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems	62	37
13. Reactor Auxiliary Systems		2
14. Safety Systems		44
15. Reactor Cooling Systems		102
16. Steam generation systems		36
21. Fuel Handling and Storage Facilities	1091	65
31. Turbine and auxiliaries	327	44
32. Feedwater and Main Steam System		32
33. Circulating Water System		12
35. All other I&C Systems		1
41. Main Generator Systems		11
42. Electrical Power Supply Systems		35
XX. Miscellaneous Systems		15
Total	1480	442

## CA-17 POINT LEPREAU

**Operator:** NBEPC (NEW BRUNSWICK ELECTRIC POWER COMMISSION)

**Contractor:** AECL (ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 660.0 MW(e)  
**Design Net Capacity:** 660.0 MW(e)  
**Design Discharge Burnup:** 8000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 4724.6 GW(e)·h  
**Energy Availability Factor:** 81.9%  
**Load Factor:** 81.7%  
**Operating Factor:** 82.5%  
**Energy Unavailability Factor:** 18.1%  
**Total Off-line Time:** 1531 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	489.6	443.5	496.3	410.2	27.8	0.0	444.6	488.6	473.2	485.8	475.1	489.9	4724.6
<b>EAF (%)</b>	100.0	99.7	100.0	86.3	5.7	0.0	91.4	99.9	99.9	99.9	100.0	100.0	81.9
<b>UCF (%)</b>	100.0	99.7	100.0	86.3	5.7	0.0	91.4	99.9	99.9	99.9	100.0	100.0	81.9
<b>LF (%)</b>	99.7	100.0	101.1	86.3	5.7	0.0	90.5	99.5	99.6	98.9	100.0	99.8	81.7
<b>OF (%)</b>	100.0	100.0	100.0	88.8	6.7	0.0	95.2	100.0	100.0	100.0	100.0	100.0	82.5
<b>EUf (%)</b>	0.0	0.3	0.0	13.7	94.3	100.0	8.6	0.1	0.1	0.1	0.0	0.0	18.1
<b>PUf (%)</b>	0.0	0.1	0.0	0.0	94.3	44.0	2.4	0.0	0.1	0.0	0.0	0.0	11.8
<b>UCLF (%)</b>	0.0	0.2	0.0	13.7	0.0	56.0	6.2	0.1	0.0	0.0	0.0	0.0	6.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THERE WAS ONE FORCED OUTAGE FOR FIRE RESISTANT FLUID(FRF) TURBINE SYSTEM. THERE WAS ONE PLANNED OUTAGE WHICH WAS EXTENDED DUE TO THE NEED FOR STATION SERVICE TRANSFORMER REPAIRS.

### 5. Historical Summary

**Date of Construction Start:** 01 May 1975 **Lifetime Generation:** 124192.9 GW(e)·h  
**Date of First Criticality:** 25 Jul 1982 **Cumulative Energy Availability Factor:** 70.3%  
**Date of Grid Connection:** 11 Sep 1982 **Cumulative Load Factor:** 69.5%  
**Date of Commercial Operation:** 01 Feb 1983 **Cumulative Unit Capability Factor:** 71.2%  
**Cumulative Energy Unavailability Factor:** 29.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	4404.5	640	86.0	86.0	86.0	86.0	85.9	85.9	7164	89.4
1984	5000.9	635	89.0	87.6	88.9	87.5	89.7	87.8	7927	90.2
1985	5421.9	635	96.9	90.8	96.9	90.7	97.5	91.1	8547	97.6
1986	5223.1	635	94.0	91.6	93.4	91.4	93.9	91.8	8257	94.3
1987	5107.7	635	91.2	91.5	91.2	91.4	91.8	91.8	8110	92.6
1988	5338.3	635	94.9	92.1	94.9	92.0	95.7	92.5	8383	95.4
1989	5266.7	635	93.8	92.3	93.6	92.2	94.7	92.8	8271	94.4
1990	5333.7	635	95.0	92.7	94.7	92.5	95.9	93.2	8384	95.7
1991	5437.2	635	96.7	93.1	96.7	93.0	97.7	93.7	8500	97.0
1992	4829.8	635	85.8	92.4	85.8	92.3	86.6	93.0	7748	88.2
1993	5320.0	635	95.1	92.6	95.1	92.5	95.6	93.2	8391	95.8
1994	5230.1	635	93.5	92.7	93.5	92.6	94.0	93.3	8270	94.4
1995	1611.4	635	29.0	87.8	29.0	87.7	29.0	88.3	2615	29.9
1996	4587.8	635	81.4	87.3	81.4	87.2	82.3	87.9	7363	83.8
1997	3455.6	635	62.2	85.6	61.6	85.5	62.1	86.2	5564	63.5
1998	3782.4	635	67.1	84.5	66.0	84.3	68.0	85.0	6111	69.8
1999	4082.7	635	75.5	83.9	72.0	83.6	73.4	84.3	6797	77.6
2000	3966.9	635	77.6	83.6	70.5	82.8	71.1	83.6	6792	77.3
2001	4451.3	635	84.6	83.6	79.1	82.6	80.0	83.4	7418	84.7
2002	3760.6	635	71.6	83.0	67.6	81.9	67.6	82.6	6107	69.7
2003	4739.5	635	89.8	83.4	84.4	82.0	85.2	82.7	7869	89.8
2004	4299.7	635	83.3	83.4	82.6	82.0	77.1	82.5	7310	83.2

2005	4372.6	635	86.8	83.5	86.8	82.2	78.6	82.3	7632	87.1
2006	4362.0	635	88.7	83.7	88.7	82.5	78.4	82.1	7755	88.5
2007	4121.8	635	85.9	83.8	85.9	82.6	74.1	81.8	7511	85.7
2008	1150.6	635	24.0	81.5	24.0	80.4	20.6	79.5	2111	24.0
2009	0.0	635	0.0	78.5	0.0	77.4	0.0	76.5	0	0.0
2010	0.0	635	0.0	75.7	0.0	74.6	0.0	73.8	0	0.0
2011	0.0	635	0.0	73.1	0.0	72.0	0.0	71.2	0	0.0
2012	411.5	660	7.5	70.8	7.5	69.9	7.3	69.1	966	11.0
2013	4111.2	660	70.8	70.8	70.8	69.9	71.1	69.1	7879	90.0
2014	4724.6	660	81.9	71.2	81.9	70.3	81.7	69.5	7229	82.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		522			244	
C. Inspection, maintenance or repair combined with refuelling				17		
D. Inspection, maintenance or repair without refuelling	1008			410		
E. Testing of plant systems or components				0	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1267		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				27		
H. Nuclear regulatory requirements					1	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					65	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
Z. Other					28	
Subtotal	1008	522	0	1721	339	4
Total		1530			2064	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		15
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		5
14. Safety Systems		22
15. Reactor Cooling Systems		57
16. Steam generation systems		48
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries	80	29
32. Feedwater and Main Steam System		23
41. Main Generator Systems		6
42. Electrical Power Supply Systems	441	5
XX. Miscellaneous Systems		3
Total	521	238

# CN-2 DAYA BAY-1

**Operator:** DNMC (Daya Bay Nuclear power Operations and Management Co.,Ltd.)

**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 944.0 MW(e)  
**Design Net Capacity:** 930.0 MW(e)  
**Design Discharge Burnup:** 35000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 8247.5 GW(e)·h  
**Energy Availability Factor:** 99.3%  
**Load Factor:** 99.7%  
**Operating Factor:** 99.7%  
**Energy Unavailability Factor:** 0.7%  
**Total Off-line Time:** 25 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	708.6	641.8	710.7	685.6	705.9	677.2	697.0	700.5	674.9	695.5	678.5	671.4	8247.5
<b>EAF (%)</b>	99.8	100.0	100.0	100.0	100.0	99.6	99.2	99.7	99.3	99.0	99.8	95.6	99.3
<b>UCF (%)</b>	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.3	99.8	95.6	99.5
<b>LF (%)</b>	100.9	101.2	101.2	100.9	100.5	99.6	99.2	99.7	99.3	99.0	99.8	95.6	99.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.6	99.7
<b>EUf (%)</b>	0.2	0.0	0.0	0.0	0.0	0.4	0.8	0.3	0.7	1.0	0.2	4.4	0.7
<b>PUf (%)</b>	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.2	0.8	0.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.4	0.7	0.3	0.7	0.3	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

1.CN2 WAS BASICALLY OPERATED IN BASE-LOAD MODE. 2.THERE WAS ONE SCRAM ON DEC.16 IN 2014.

## 5. Historical Summary

**Date of Construction Start:** 07 Aug 1987 **Lifetime Generation:** 146686.9 GW(e)·h  
**Date of First Criticality:** 28 Jul 1993 **Cumulative Energy Availability Factor:** 85.1%  
**Date of Grid Connection:** 31 Aug 1993 **Cumulative Load Factor:** 85.2%  
**Date of Commercial Operation:** 01 Feb 1994 **Cumulative Unit Capability Factor:** 88.2%  
**Cumulative Energy Unavailability Factor:** 14.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1994	5808.2	944	77.4	77.4	76.3	76.3	76.8	76.8	6385	79.7
1995	3723.6	944	84.6	81.2	46.2	60.6	45.0	60.2	4088	46.7
1996	6252.7	944	76.8	79.7	76.0	65.9	75.4	65.4	6847	77.9
1997	6491.2	944	82.1	80.3	74.6	68.1	78.5	68.8	7272	83.0
1998	6040.5	944	79.6	80.1	72.0	68.9	73.0	69.6	7344	83.8
1999	6723.7	944	87.7	81.4	82.7	71.2	81.3	71.6	7680	87.7
2000	6986.6	944	85.4	82.0	85.2	73.3	84.3	73.4	7641	87.0
2001	7009.3	944	87.5	82.7	84.8	74.7	84.8	74.9	7619	87.0
2002	7387.2	944	89.6	83.5	89.5	76.4	89.3	76.5	7924	90.5
2003	7400.8	944	90.9	84.2	90.4	77.8	89.5	77.8	7958	90.8
2004	7540.9	944	88.5	84.6	88.2	78.7	90.9	79.0	7789	88.7
2005	8260.5	944	100.0	85.9	100.0	80.5	99.9	80.8	8760	100.0
2006	6635.1	944	79.9	85.4	79.9	80.5	80.2	80.7	7133	81.4
2007	7542.1	944	91.2	85.8	91.2	81.2	91.2	81.5	8074	92.2
2008	8255.5	944	100.0	86.8	99.8	82.5	99.6	82.7	8774	99.9
2009	7439.1	944	90.9	87.0	90.8	83.0	90.0	83.1	8055	92.0
2010	7328.5	944	89.0	87.2	89.0	83.4	88.6	83.5	7876	89.9
2011	8222.6	944	100.0	87.9	100.0	84.3	99.4	84.4	8760	100.0
2012	6952.2	944	83.9	87.7	83.6	84.3	83.8	84.3	7452	84.8
2013	7150.0	944	86.7	87.6	86.4	84.4	86.5	84.4	7682	87.7
2014	8247.5	944	99.5	88.2	99.3	85.1	99.7	85.2	8735	99.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1994 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		24			111	
C. Inspection, maintenance or repair combined with refuelling				836		
D. Inspection, maintenance or repair without refuelling				13		
E. Testing of plant systems or components					0	
J. Grid limitation, failure or grid unavailability						14
Z. Other						146
Subtotal	0	24	0	849	111	160
Total		24			1120	

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1994 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	24	8
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems		7
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		14
33. Circulating Water System		2
41. Main Generator Systems		46
42. Electrical Power Supply Systems		26
Total	24	107

## CN-3 DAYA BAY-2

**Operator:** DNMC (Daya Bay Nuclear power Operations and Management Co.,Ltd.)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 944.0 MW(e)  
**Design Net Capacity:** 930.0 MW(e)  
**Design Discharge Burnup:** 35000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6250.0 GW(e)·h  
**Energy Availability Factor:** 75.2%  
**Load Factor:** 75.6%  
**Operating Factor:** 75.7%  
**Energy Unavailability Factor:** 24.8%  
**Total Off-line Time:** 2131 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	709.4	641.7	710.4	682.6	703.8	675.5	693.3	696.8	669.7	66.8	0.0	0.0	6250.0
<b>EAF (%)</b>	100.0	100.0	100.0	99.7	100.0	99.4	98.7	99.2	98.5	9.5	0.0	0.0	75.2
<b>UCF (%)</b>	100.0	100.0	100.0	99.7	100.0	100.0	99.9	100.0	99.9	9.6	0.0	0.0	75.6
<b>LF (%)</b>	101.0	101.2	101.2	100.4	100.2	99.4	98.7	99.2	98.5	9.5	0.0	0.0	75.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	10.3	0.0	0.0	75.7
<b>EUf (%)</b>	0.0	0.0	0.0	0.3	0.0	0.6	1.3	0.8	1.5	90.5	100.0	100.0	24.8
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	90.4	100.0	100.0	24.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.6	1.2	0.8	1.4	0.1	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1.CN3 WAS BASICALLY OPERATED IN BASE-LOAD MODE. THERE WAS NO SCRAM IN 2014. 2.CN3 WAS BEARING ITS SEVENTEENTH REFUELING OUTAGE FROM OCT.4 IN 2014 TO JAN.3 IN 2015, LASTING 91.38DAYS.

### 5. Historical Summary

**Date of Construction Start:** 07 Apr 1988 **Lifetime Generation:** 143401.5 GW(e)·h  
**Date of First Criticality:** 21 Jan 1994 **Cumulative Energy Availability Factor:** 84.2%  
**Date of Grid Connection:** 07 Feb 1994 **Cumulative Load Factor:** 84.2%  
**Date of Commercial Operation:** 06 May 1994 **Cumulative Unit Capability Factor:** 85.7%  
**Cumulative Energy Unavailability Factor:** 15.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1994	5014.2	944	99.4	99.4	92.3	92.3	90.3	90.3	5761	98.0
1995	6343.3	944	81.1	88.4	77.5	83.4	76.7	82.2	7146	81.6
1996	5276.9	944	67.4	80.6	63.9	76.1	63.6	75.2	5740	65.3
1997	5914.8	944	70.1	77.7	67.4	73.8	71.5	74.2	6194	70.7
1998	6259.1	944	82.9	78.8	74.7	74.0	75.7	74.5	7302	83.4
1999	6789.5	944	86.2	80.1	83.3	75.6	82.1	75.9	7594	86.7
2000	6995.5	944	89.1	81.5	88.4	77.5	84.4	77.1	7840	89.3
2001	7355.5	944	91.1	82.7	89.5	79.1	88.9	78.7	7986	91.2
2002	6728.9	944	82.2	82.7	81.6	79.4	81.4	79.0	7224	82.5
2003	6983.1	944	84.6	82.9	84.5	79.9	84.4	79.6	7503	85.7
2004	6358.9	944	74.4	82.1	74.2	79.4	76.7	79.3	6580	74.9
2005	6587.0	944	79.6	81.9	79.6	79.4	79.7	79.3	7075	80.8
2006	8222.8	944	99.9	83.3	99.9	81.0	99.4	80.9	8760	100.0
2007	7344.2	944	88.8	83.7	88.8	81.6	88.8	81.5	7858	89.7
2008	7174.4	944	86.3	83.9	86.3	81.9	86.5	81.8	7667	87.3
2009	8222.6	944	100.0	84.9	100.0	83.1	99.4	82.9	8760	100.0
2010	7685.6	944	92.5	85.3	92.5	83.6	92.9	83.5	8197	93.6
2011	7113.1	944	86.3	85.4	86.2	83.8	86.0	83.7	7649	87.3
2012	8305.0	944	100.0	86.2	99.7	84.6	100.2	84.6	8784	100.0
2013	7091.4	944	85.8	86.2	85.6	84.7	85.8	84.6	7605	86.8
2014	6250.0	944	75.6	85.7	75.2	84.2	75.6	84.2	6629	75.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1994 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					130	
C. Inspection, maintenance or repair combined with refuelling	2133			811	10	
D. Inspection, maintenance or repair without refuelling				13		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						15
L. Human factor related					19	
Subtotal	2133	0	0	824	159	15
Total		2133			998	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1994 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		6
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		51
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		1
35. All other I&C Systems		1
41. Main Generator Systems		45
42. Electrical Power Supply Systems		19
Total	0	125



# CN-24 FANGJIASHAN-1

**Operator:** QNPC (QINSHAN NUCLEAR POWER COMPANY)

**Contractor:** NPIC (Nuclear Power Institute of China)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1000.0 MW(e)  
**Design Net Capacity:** 1000.0 MW(e)  
**Design Discharge Burnup:** 33000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 744 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h												0.0	0.0
EAF (%)												100.0	100.0
UCF (%)												100.0	100.0
LF (%)												0.0	0.0
OF (%)												0.0	0.0
EUf (%)												0.0	0.0
PUf (%)												0.0	0.0
UCLF (%)												0.0	0.0
XUF (%)												0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

N/A

## 5. Historical Summary

**Date of Construction Start:** 26 Dec 2008  
**Date of First Criticality:** 21 Oct 2014  
**Date of Grid Connection:** 04 Nov 2014  
**Date of Commercial Operation:** 15 Dec 2014

**Lifetime Generation:** 0.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 100.0%  
**Cumulative Load Factor:** 0.0%  
**Cumulative Unit Capability Factor:** 100.0%  
**Cumulative Energy Unavailability Factor:** 0.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2014	0.0	1000	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2014 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External

The reactor has not yet completed a full year of commercial operation.

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2014 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

# CN-20 FUQING-1

**Operator:** FQNP (CNNC Fujian Fuqing Nuclear Power co.,LTD)

**Contractor:** NPIC (Nuclear Power Institute of China)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1000.0 MW(e)  
**Design Net Capacity:** 1000.0 MW(e)  
**Design Discharge Burnup:** 33000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 1033.1 GW(e)·h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 70.6%  
**Operating Factor:** 64.8%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 515 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h											222.1	810.9	1033.1
EAF (%)											100.0	100.0	100.0
UCF (%)											100.0	100.0	100.0
LF (%)											30.9	109.0	70.6
OF (%)											28.5	100.0	64.8
EUf (%)											0.0	0.0	0.0
PUf (%)											0.0	0.0	0.0
UCLF (%)											0.0	0.0	0.0
XUF (%)											0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

UNIT 1 HAD BEEN KEEPING AT FULL POWER SINCE IT WAS PUT INTO COMMERCIAL OPERATION ON NOV. 22TH OF 2014. NO SCRAMS OCCURRED IN 2014.

## 5. Historical Summary

**Date of Construction Start:** 21 Nov 2008  
**Date of First Criticality:** 24 Jul 2014  
**Date of Grid Connection:** 20 Aug 2014  
**Date of Commercial Operation:** 22 Nov 2014

**Lifetime Generation:** 1033.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 100.0%  
**Cumulative Load Factor:** 70.6%  
**Cumulative Unit Capability Factor:** 100.0%  
**Cumulative Energy Unavailability Factor:** 0.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2014	1033.1	1000	100.0	100.0	100.0	100.0	70.6	70.6	949	64.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2014 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External

The reactor has not yet completed a full year of commercial operation.

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2014 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

# CN-16 HONGYANHE-1

**Operator:** LHNPC (Liaoning Hongyanhe Nuclear Power Co. Ltd. (LHNPC))

**Contractor:** DEC (Dongfang Electric Corporation)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1061.0 MW(e)  
**Design Net Capacity:** 1061.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6093.2 GW(e)-h  
**Energy Availability Factor:** 68.4%  
**Load Factor:** 65.6%  
**Operating Factor:** 71.0%  
**Energy Unavailability Factor:** 31.6%  
**Total Off-line Time:** 2542 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)-h</b>	775.4	671.4	473.8	0.0	0.0	468.3	613.6	704.7	715.0	744.0	259.9	667.0	6093.2
<b>EAF (%)</b>	99.9	99.9	59.4	0.0	0.0	61.8	80.9	100.0	99.9	99.8	32.6	86.7	68.4
<b>UCF (%)</b>	99.9	99.9	59.4	0.0	0.0	61.8	80.9	100.0	99.9	99.8	43.8	87.1	69.3
<b>LF (%)</b>	98.2	94.2	60.0	0.0	0.0	61.3	77.7	89.3	93.6	94.3	34.0	84.5	65.6
<b>OF (%)</b>	100.0	100.0	61.3	0.0	0.0	73.3	84.1	100.0	100.0	100.0	46.7	87.1	71.0
<b>EUf (%)</b>	0.1	0.1	40.6	100.0	100.0	38.2	19.1	0.0	0.1	0.2	67.4	13.3	31.6
<b>PUf (%)</b>	0.0	0.1	40.6	100.0	100.0	34.4	0.0	0.0	0.1	0.2	0.0	0.0	23.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	3.7	19.1	0.0	0.0	0.0	56.2	12.9	7.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.2	0.4	0.9

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

AT THE REQUEST OF THE SATE GRID;THE POWER WAS REDUCED SEPARATELY FOR SOME PERIOD OF TIME.

## 5. Historical Summary

**Date of Construction Start:** 18 Aug 2007 **Lifetime Generation:** 11870.6 GW(e)-h  
**Date of First Criticality:** 16 Jan 2013 **Cumulative Energy Availability Factor:** 79.6%  
**Date of Grid Connection:** 17 Feb 2013 **Cumulative Load Factor:** 79.2%  
**Date of Commercial Operation:** 06 Jun 2013 **Cumulative Unit Capability Factor:** 80.5%  
**Cumulative Energy Unavailability Factor:** 20.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2013	5580.8	1061	99.6	99.6	98.6	98.6	102.4	102.4	5136	100.0
2014	6093.2	1061	69.3	80.5	68.4	79.6	65.6	79.2	6218	71.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2013 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		627				
C. Inspection, maintenance or repair combined with refuelling	1928					
Subtotal	1928	627	0	0	0	0
Total		2555			0	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2013 to 2014 Average Hours Lost Per Year
33. Circulating Water System	130	
41. Main Generator Systems	480	
42. Electrical Power Supply Systems	16	
Total	626	0

## CN-17 HONGYANHE-2

**Operator:** LHNPC (Liaoning Hongyanhe Nuclear Power Co. Ltd. (LHNPC))

**Contractor:** DEC (Dongfang Electric Corporation)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1061.0 MW(e)  
**Design Net Capacity:** 1061.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 4520.7 GW(e)·h  
**Energy Availability Factor:** 81.1%  
**Load Factor:** 72.5%  
**Operating Factor:** 79.8%  
**Energy Unavailability Factor:** 18.9%  
**Total Off-line Time:** 1187 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h					652.0	731.0	489.2	576.0	661.0	675.6	649.0	86.8	4520.7
EAF (%)					99.9	98.2	63.1	80.9	99.5	97.8	100.0	11.0	81.1
UCF (%)					99.9	98.2	63.1	80.9	99.5	97.8	100.0	11.0	81.1
LF (%)					82.6	95.7	62.0	73.0	86.5	85.6	85.0	11.0	72.5
OF (%)					81.9	100.0	64.9	83.2	99.6	98.9	100.0	12.0	79.8
EUf (%)					0.1	1.8	36.9	19.1	0.5	2.2	0.0	89.0	18.9
PUf (%)					0.0	0.0	0.0	0.0	0.0	0.1	0.0	89.0	11.3
UCLF (%)					0.1	1.8	36.9	19.1	0.5	2.1	0.0	0.0	7.6
XUF (%)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

AT THE REQUEST OF THE SATE GRID THE POWER WAS REDUCED SEPARATELY FOR SOME PERIOD OF TIME.

### 5. Historical Summary

**Date of Construction Start:** 28 Mar 2008 **Lifetime Generation:** 5042.6 GW(e)·h  
**Date of First Criticality:** 24 Oct 2013 **Cumulative Energy Availability Factor:** 81.1%  
**Date of Grid Connection:** 23 Nov 2013 **Cumulative Load Factor:** 72.5%  
**Date of Commercial Operation:** 13 May 2014 **Cumulative Unit Capability Factor:** 81.1%  
**Cumulative Energy Unavailability Factor:** 18.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2014	4520.7	1061	81.1	81.1	81.1	81.1	72.5	72.5	4693	79.8

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2014 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External

The reactor has not yet completed a full year of commercial operation.

### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2014 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

## CN-6 LING AO-1

**Operator:** DNMC (Daya Bay Nuclear power Operations and Management Co.,Ltd.)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7361.9 GW(e)·h  
**Energy Availability Factor:** 89.4%  
**Load Factor:** 88.5%  
**Operating Factor:** 90.2%  
**Energy Unavailability Factor:** 10.6%  
**Total Off-line Time:** 861 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	695.8	614.7	713.6	685.7	493.9	85.2	699.5	651.2	675.9	647.3	686.4	712.8	7361.9
<b>EAF (%)</b>	100.0	100.0	100.0	99.9	69.9	12.5	99.0	92.9	98.9	99.1	100.0	100.0	89.4
<b>UCF (%)</b>	100.0	100.0	100.0	99.9	71.2	13.9	99.9	99.8	100.0	100.0	100.0	100.0	90.4
<b>LF (%)</b>	98.4	96.3	101.0	100.2	69.9	12.5	99.0	92.1	98.8	91.6	100.3	100.9	88.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	71.4	23.6	100.0	93.8	100.0	93.0	100.0	100.0	90.2
<b>EUAF (%)</b>	0.0	0.0	0.0	0.1	30.1	87.5	1.0	7.1	1.1	0.9	0.0	0.0	10.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	28.8	53.5	0.1	0.0	0.0	0.0	0.0	0.0	6.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.1	0.0	32.6	0.0	0.2	0.0	0.0	0.0	0.0	2.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.3	1.4	1.0	6.9	1.1	0.9	0.0	0.0	1.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1.CN6 WAS BASICALLY OPERATED IN BASE-LOAD MODE. THERE WAS NO SCRAM IN 2014.2.CN6 WAS BEARING ITS 12TH REFUELING OUTAGE FROM MAY 23 TO JUN.23 IN 2014, LASTING 31.78 DAYS.

### 5. Historical Summary

**Date of Construction Start:** 15 May 1997 **Lifetime Generation:** 91525.8 GW(e)·h  
**Date of First Criticality:** 04 Feb 2002 **Cumulative Energy Availability Factor:** 88.6%  
**Date of Grid Connection:** 26 Feb 2002 **Cumulative Load Factor:** 87.3%  
**Date of Commercial Operation:** 28 May 2002 **Cumulative Unit Capability Factor:** 88.9%  
**Cumulative Energy Unavailability Factor:** 11.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2002	4583.8	938	95.7	95.7	95.7	95.7	83.1	83.1	5184	88.1
2003	6375.0	938	82.3	87.7	80.4	86.5	77.6	79.8	7215	82.4
2004	7331.4	938	89.0	88.2	88.7	87.3	89.0	83.2	7884	89.8
2005	6906.4	938	84.3	87.1	84.3	86.5	84.1	83.5	7424	84.7
2006	7401.0	938	90.1	87.7	90.1	87.3	90.1	84.9	7964	90.9
2007	6835.0	938	83.2	86.9	83.2	86.6	83.2	84.6	7345	83.8
2008	7542.9	938	92.1	87.7	91.2	87.3	91.5	85.6	8163	92.9
2009	7002.5	938	90.4	88.1	90.3	87.7	85.2	85.6	7997	91.3
2010	7714.6	938	93.7	88.7	93.6	88.3	93.9	86.5	8288	94.6
2011	7571.4	938	91.2	89.0	91.2	88.6	92.1	87.1	8072	92.1
2012	7657.3	938	93.5	89.4	93.4	89.1	92.9	87.7	8286	94.3
2013	6841.7	950	82.8	88.8	82.5	88.5	82.3	87.2	7340	83.8
2014	7361.9	950	90.4	88.9	89.4	88.6	88.5	87.3	7899	90.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2003 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					95	
C. Inspection, maintenance or repair combined with refuelling	532	234		776		
J. Grid limitation, failure or grid			13			

unavailability						
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			60			
Subtotal	532	234	73	776	95	0
Total	839			871		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2003 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		2
15. Reactor Cooling Systems		48
16. Steam generation systems		3
42. Electrical Power Supply Systems		41
Total	0	94

## CN-7 LING AO-2

**Operator:** DNMC (Daya Bay Nuclear power Operations and Management Co.,Ltd.)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7773.3 GW(e)·h  
**Energy Availability Factor:** 94.3%  
**Load Factor:** 93.4%  
**Operating Factor:** 95.5%  
**Energy Unavailability Factor:** 5.7%  
**Total Off-line Time:** 397 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	254.6	602.4	716.8	680.9	700.6	682.7	688.1	701.4	670.8	673.6	687.9	713.4	7773.3
<b>EAF (%)</b>	37.3	99.8	100.0	100.0	100.0	99.8	97.4	99.9	99.5	99.5	99.9	100.0	94.3
<b>UCF (%)</b>	37.3	99.8	100.0	100.0	100.0	100.0	98.0	100.0	100.0	100.0	99.9	100.0	94.5
<b>LF (%)</b>	36.0	94.4	101.4	99.5	99.1	99.8	97.4	99.2	98.1	95.3	100.6	100.9	93.4
<b>OF (%)</b>	48.4	100.0	100.0	100.0	100.0	100.0	98.3	100.0	100.0	100.0	100.0	100.0	95.5
<b>EUf (%)</b>	62.7	0.2	0.0	0.0	0.0	0.2	2.6	0.1	0.5	0.5	0.1	0.0	5.7
<b>PUf (%)</b>	62.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	5.3
<b>UCLF (%)</b>	0.1	0.2	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.2	0.6	0.1	0.5	0.5	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1.CN7 WAS BASICALLY OPERATED IN BASE-LOAD MODE.2.THERE WAS AN UNPLANNED SCRAM IN 2014.3.CN7 WAS BEARING ITS ELEVENTH REFUELING OUTAGE FROM NOV.22. 2013 TO JAN.17.2014, LASTING 56.29 DAYS.

### 5. Historical Summary

**Date of Construction Start:** 28 Nov 1997 **Lifetime Generation:** 88331.3 GW(e)·h  
**Date of First Criticality:** 27 Aug 2002 **Cumulative Energy Availability Factor:** 89.6%  
**Date of Grid Connection:** 14 Sep 2002 **Cumulative Load Factor:** 89.3%  
**Date of Commercial Operation:** 08 Jan 2003 **Cumulative Unit Capability Factor:** 89.7%  
**Cumulative Energy Unavailability Factor:** 10.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2003	6934.9	938	90.6	90.6	89.9	89.9	84.4	84.4	7494	85.5
2004	6669.4	938	79.9	85.2	79.8	84.9	80.9	82.7	7109	80.9
2005	7530.9	938	91.6	87.3	91.3	87.0	91.7	85.7	8075	92.2
2006	7661.0	938	92.1	88.5	92.1	88.3	93.2	87.6	8164	93.2
2007	7215.1	938	87.8	88.4	87.8	88.2	87.8	87.6	7796	89.0
2008	7077.1	938	85.2	87.8	85.2	87.7	85.9	87.3	7577	86.3
2009	7433.8	938	90.9	88.3	90.9	88.1	90.5	87.8	8052	91.9
2010	7505.5	938	90.8	88.6	90.8	88.5	91.3	88.2	8112	92.6
2011	7734.3	938	93.7	89.2	93.7	89.1	94.1	88.9	8284	94.6
2012	7474.5	938	91.1	89.4	90.9	89.3	90.7	89.1	8113	92.4
2013	7261.3	950	88.6	89.3	87.9	89.1	87.3	88.9	7804	89.1
2014	7773.3	950	94.5	89.7	94.3	89.6	93.4	89.3	8363	95.5

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2003 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		13			31	
C. Inspection, maintenance or repair combined with refuelling	395			750		
L. Human factor related					0	

Subtotal	395	13	0	750	31	0
Total	408			781		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2003 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	13	
32. Feedwater and Main Steam System		3
41. Main Generator Systems		27
Total	13	30



## CN-12 LING AO-3

**Operator:** DNMC (Daya Bay Nuclear power Operations and Management Co.,Ltd.)

**Contractor:** DEC (Dongfang Electric Corporation)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1007.0 MW(e)  
**Design Net Capacity:** 1007.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7854.1 GW(e)·h  
**Energy Availability Factor:** 88.9%  
**Load Factor:** 89.0%  
**Operating Factor:** 90.2%  
**Energy Unavailability Factor:** 11.1%  
**Total Off-line Time:** 859 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	765.8	691.7	491.9	226.8	761.8	722.2	734.7	728.3	690.8	712.9	738.0	589.0	7854.1
<b>EAF (%)</b>	100.0	99.9	64.6	31.3	100.0	99.8	98.0	98.6	97.9	99.9	100.0	77.2	88.9
<b>UCF (%)</b>	100.0	99.9	64.6	31.3	100.0	99.8	100.0	100.0	100.0	99.9	100.0	77.2	89.4
<b>LF (%)</b>	102.2	102.2	65.7	31.3	101.7	99.6	98.1	97.2	95.3	95.2	101.8	78.6	89.0
<b>OF (%)</b>	100.0	100.0	65.1	39.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	78.0	90.2
<b>EUf (%)</b>	0.0	0.1	35.4	68.7	0.0	0.2	2.0	1.4	2.1	0.1	0.0	22.8	11.1
<b>PUf (%)</b>	0.0	0.1	35.4	68.7	0.0	0.0	0.0	0.0	0.0	0.1	0.0	22.5	10.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.4	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.4	2.1	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1.CN12 WAS BASICALLY OPERATED IN BASE-LOAD MODE. THERE WAS NO SCRAM IN 2014.2.BY THE REQUEST OF GRID SYSTEM,CN12 WAS DELOADED FOR SOME HOLIDAYS AND OTHER REASONS.3.CN12 WAS BEARING ITS FOURTH REFUELLING OUTAGE FROM MAR 21 TO APR 19 LASTING 28.98 DAYS.4.CN12 WAS BEARING ITS FIFTH REFUELLING OUTAGE FROM DEC 25 TO JAN 31,2015 LASTING 37.51 DAYS.

### 5. Historical Summary

**Date of Construction Start:** 15 Dec 2005 **Lifetime Generation:** 31460.5 GW(e)·h  
**Date of First Criticality:** 09 Jun 2010 **Cumulative Energy Availability Factor:** 83.9%  
**Date of Grid Connection:** 15 Jul 2010 **Cumulative Load Factor:** 82.7%  
**Date of Commercial Operation:** 15 Sep 2010 **Cumulative Unit Capability Factor:** 84.2%  
**Cumulative Energy Unavailability Factor:** 16.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2010	1828.5	1007	77.6	77.6	77.6	77.6	62.0	62.0	1884	64.3
2011	6333.2	1007	71.3	72.9	71.3	72.9	71.8	69.3	6866	78.4
2012	7720.9	1020	88.3	79.5	88.0	79.4	86.8	76.9	7877	89.7
2013	7942.1	1007	90.1	82.7	89.6	82.5	90.0	80.8	8017	91.5
2014	7854.1	1007	89.4	84.2	88.9	83.9	89.0	82.7	7901	90.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2010 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					40	
C. Inspection, maintenance or repair combined with refuelling	860			671		
D. Inspection, maintenance or repair without refuelling				187		
Subtotal	860	0	0	858	40	0
Total		860			898	

### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2010 to 2014 Average Hours Lost Per Year
15. Reactor Cooling Systems		28
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		9
Total	0	39

## CN-13 LING AO-4

**Operator:** DNMC (Daya Bay Nuclear power Operations and Management Co.,Ltd.)

**Contractor:** DEC (Dongfang Electric Corporation)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1007.0 MW(e)  
**Design Net Capacity:** 1007.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7896.0 GW(e)·h  
**Energy Availability Factor:** 89.8%  
**Load Factor:** 89.5%  
**Operating Factor:** 91.0%  
**Energy Unavailability Factor:** 10.2%  
**Total Off-line Time:** 788 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	344.4	227.6	765.7	730.8	747.6	712.8	742.6	744.4	676.7	701.9	736.6	764.9	7896.0
<b>EAF (%)</b>	45.3	33.6	100.0	100.0	100.0	100.0	98.8	100.0	96.0	99.9	100.0	100.0	89.8
<b>UCF (%)</b>	45.3	33.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	90.3
<b>LF (%)</b>	46.0	33.6	102.2	100.8	99.8	98.3	99.1	99.4	93.3	93.7	101.6	102.1	89.5
<b>OF (%)</b>	45.7	42.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.0
<b>EUf (%)</b>	54.7	66.4	0.0	0.0	0.0	0.0	1.2	0.0	4.0	0.1	0.0	0.0	10.2
<b>PUf (%)</b>	54.7	66.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	9.7
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	4.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1.CN13 WAS BASICALLY OPERATED IN BASE-LOAD MODE. THERE WAS NO SCRAM IN 2014.2.BY THE REQUEST OF GRID SYSTEM,CN13 WAS DELOADED FOR SOME HOLIDAYS AND OTHER REASONS.3.CN13 WAS BEARING ITS THIRD REFUELLING OUTAGE FROM JAN 15 TO FEB 17 LASTING 32.88 DAYS.

### 5. Historical Summary

**Date of Construction Start:** 15 Jun 2006 **Lifetime Generation:** 26308.0 GW(e)·h  
**Date of First Criticality:** 25 Feb 2011 **Cumulative Energy Availability Factor:** 87.7%  
**Date of Grid Connection:** 03 May 2011 **Cumulative Load Factor:** 86.9%  
**Date of Commercial Operation:** 07 Aug 2011 **Cumulative Unit Capability Factor:** 88.2%  
**Cumulative Energy Unavailability Factor:** 12.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2011	3549.9	1007	99.6	99.6	99.6	99.6	96.0	96.0	3672	100.0
2012	7009.7	1020	80.6	86.1	80.1	85.8	78.2	83.4	7156	81.5
2013	7870.2	1007	89.0	87.3	88.4	86.9	89.2	85.8	7880	90.0
2014	7896.0	1007	90.3	88.2	89.8	87.7	89.5	86.9	7972	91.0

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2011 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	789			628		
Subtotal	789	0	0	628	0	0
Total	789			628		

### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2011 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

# CN-18 NINGDE-1

**Operator:** NDNP (Fujian Ningde Nuclear Power Company Ltd.)

**Contractor:** DEC (Dongfang Electric Corporation)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP at the beginning of 2014):** 1018.0 MW(e)  
**Design Net Capacity:** 1018.0 MW(e)  
**Design Discharge Burnup:** 44000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 5047.2 GW(e)·h  
**Energy Availability Factor:** 56.7%  
**Load Factor:** 56.6%  
**Operating Factor:** 58.4%  
**Energy Unavailability Factor:** 43.3%  
**Total Off-line Time:** 3641 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	650.2	0.0	0.0	8.5	188.4	0.0	505.2	749.1	715.7	746.7	724.3	759.2	5047.2
EAF (%)	86.3	0.0	0.0	1.0	22.4	0.0	66.3	100.0	99.9	98.7	100.0	100.0	56.7
UCF (%)	86.3	0.0	0.0	1.0	22.4	0.0	66.3	100.0	99.9	98.7	100.0	100.0	56.7
LF (%)	85.9	0.0	0.0	1.2	24.9	0.0	66.7	98.9	97.6	98.6	98.8	100.2	56.6
OF (%)	88.0	0.0	0.0	6.0	30.9	0.0	69.8	100.0	100.0	100.0	100.0	100.0	58.4
EUUF (%)	13.7	100.0	100.0	99.0	77.6	100.0	33.7	0.0	0.1	1.3	0.0	0.0	43.3
PUF (%)	13.7	100.0	100.0	52.5	3.2	0.0	0.0	0.0	0.1	0.2	0.0	0.0	22.0
UCLF (%)	0.0	0.0	0.0	46.5	74.4	100.0	33.7	0.0	0.0	1.2	0.0	0.0	21.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

FROM JANUARY 28 TO APRIL 29 WAS THE FIRST REFUELING OUTAGE, FROM MAY 10 TO JULY 10 WAS THE OUTAGE OF TURBO ROTOR REPAIR WHICH LAST FOR 60 DAYS, REMAINED STABLE FOR THE REMAINDER OPERATION. BY THE REASON OF THE OUTAGE AND THE EFFECTS OF STEAM TURBINE ROTOR BENDING REPAIR, MANY INDICATORS WERE SIGNIFICANTLY AFFECTED. THERE WERE 3 WANO PERFORMANCE INDICATORS REACHED THE WORLD ADVANCED LEVEL.

## 5. Historical Summary

**Date of Construction Start:** 18 Feb 2008 **Lifetime Generation:** 11995.2 GW(e)·h  
**Date of First Criticality:** 24 Nov 2012 **Cumulative Energy Availability Factor:** 75.3%  
**Date of Grid Connection:** 28 Dec 2012 **Cumulative Load Factor:** 73.8%  
**Date of Commercial Operation:** 15 Apr 2013 **Cumulative Unit Capacity Factor:** 75.3%  
**Cumulative Energy Unavailability Factor:** 24.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capacity Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2013	6493.0	1018	99.9	99.9	99.9	99.9	96.6	96.6	6556	99.3
2014	5047.2	1018	56.7	75.3	56.7	75.3	56.6	73.8	5119	58.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2013 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1498				
C. Inspection, maintenance or repair combined with refuelling	1867					
H. Nuclear regulatory requirements		312				
M. Governmental requirements or court decisions			5			
Subtotal	1867	1810	5	0	0	0
Total		3682			0	

## 7. Equipment Related Full Outages, Analysis by System

System	2014	2013 to 2014
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System	Hours Lost	Average Hours Lost Per Year
31. Turbine and auxiliaries	1498	
Total	1498	0

## CN-19 NINGDE-2

**Operator:** NDNP (Fujian Ningde Nuclear Power Company Ltd.)

**Contractor:** SHE (Shanghai Electric)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1018.0 MW(e)  
**Design Net Capacity:** 1018.0 MW(e)  
**Design Discharge Burnup:** 44000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 5839.4 GW(e)·h  
**Energy Availability Factor:** 99.8%  
**Load Factor:** 97.6%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.2%  
**Total Off-line Time:** 0 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h					727.0	706.3	723.0	740.9	715.2	750.3	720.3	756.5	5839.4
EAF (%)					99.9	100.0	99.4	99.9	99.9	99.8	100.0	99.9	99.8
UCF (%)					99.9	100.0	99.4	99.9	99.9	99.8	100.0	99.9	99.8
LF (%)					96.0	96.4	95.5	97.8	97.6	99.1	98.3	99.9	97.6
OF (%)					100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)					0.1	0.0	0.6	0.1	0.1	0.2	0.0	0.1	0.2
PUf (%)					0.1	0.0	0.6	0.1	0.1	0.2	0.0	0.0	0.1
UCLF (%)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
XUF (%)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT 2 WAS IN COMMERCIAL OPERATION AT MAY 4TH.DURING THE 1ST YEAR OF COMMERCIAL OPERATION, UNIT 2 HAD NO UNSCHEDULED SHUTDOWN;8 OF 9 WANO PERFORMANCE INDICATORS REACHED THE WORLD ADVANCED LEVEL.

### 5. Historical Summary

**Date of Construction Start:** 12 Nov 2008 **Lifetime Generation:** 6568.0 GW(e)·h  
**Date of First Criticality:** 20 Dec 2013 **Cumulative Energy Availability Factor:** 99.8%  
**Date of Grid Connection:** 04 Jan 2014 **Cumulative Load Factor:** 97.6%  
**Date of Commercial Operation:** 04 May 2014 **Cumulative Unit Capability Factor:** 99.8%  
**Cumulative Energy Unavailability Factor:** 0.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2014	5839.4	1018	99.8	99.8	99.8	99.8	97.6	97.6	5880	100.0

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2014 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External

The reactor has not yet completed a full year of commercial operation.

### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2014 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

## CN-4 QINSHAN 2-1

**Operator:** NPQJVC (NUCLEAR POWER PLANT QINSHAN JOINT VENTURE COMPANY LTD.)

**Contractor:** CNNC (CHINA NATIONAL NUCLEAR CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 610.0 MW(e)  
**Design Net Capacity:** 610.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 4579.2 GW(e)·h  
**Energy Availability Factor:** 83.7%  
**Load Factor:** 85.7%  
**Operating Factor:** 84.6%  
**Energy Unavailability Factor:** 16.3%  
**Total Off-line Time:** 1348 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	463.0	419.9	475.2	108.3	0.0	382.8	452.4	458.2	439.8	456.6	454.8	468.2	4579.2
<b>EAF (%)</b>	99.7	100.0	100.0	24.2	0.9	80.3	100.0	100.0	100.0	100.0	100.0	99.7	83.7
<b>UCF (%)</b>	99.7	100.0	100.0	24.2	0.9	80.3	100.0	100.0	100.0	100.0	100.0	99.7	83.7
<b>LF (%)</b>	102.0	102.4	104.7	24.7	0.0	87.2	99.7	101.0	100.1	100.6	103.5	103.2	85.7
<b>OF (%)</b>	100.0	100.0	100.0	23.8	0.0	92.4	100.0	100.0	100.0	100.0	100.0	100.0	84.6
<b>EUf (%)</b>	0.3	0.0	0.0	75.8	99.1	19.7	0.0	0.0	0.0	0.0	0.0	0.3	16.3
<b>PUf (%)</b>	0.3	0.0	0.0	75.8	99.1	19.7	0.0	0.0	0.0	0.0	0.0	0.3	16.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT 1 OPERATION AT FULL POWER IN THE BASE LOAD MODE IN 2014 YEAR FROM 2014-4-8 TO 2014-6-3, MAINTENANCE WITH 111 REFUELLING OUTAGE; THERE IS NO UNPLANNED AUTOMATIC SCRAM. THE SIGNIFICANT FACTORS AFFECTING ENERGY GENERATION IS FOLLOWS: SEVERAL POWER DERATES DUE TO GRID DEMANDS DURING THE SPRING FESTIVAL; THE MID-AUTUMN FESTIVAL AND NATIONAL DAY; 111 REFUELLING OUTAGE; SEVERAL PLANNED POWER REDUCED TO DO TURBINE VALVE TESTING.

### 5. Historical Summary

**Date of Construction Start:** 02 Jun 1996  
**Date of First Criticality:** 15 Nov 2001  
**Date of Grid Connection:** 06 Feb 2002  
**Date of Commercial Operation:** 15 Apr 2002

**Lifetime Generation:** 55354.5 GW(e)·h  
**Cumulative Energy Availability Factor:** 80.0%  
**Cumulative Load Factor:** 80.8%  
**Cumulative Unit Capability Factor:** 80.0%  
**Cumulative Energy Unavailability Factor:** 20.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2002	2965.3	610	81.6	81.6	81.6	81.6	73.6	73.6	4631	70.2
2003	4327.3	610	81.0	81.2	80.9	81.2	81.0	77.8	7123	81.3
2004	4395.7	610	80.1	80.8	80.1	80.8	82.0	79.4	7117	81.0
2005	4944.8	610	90.6	83.4	90.6	83.4	92.5	82.9	7982	91.1
2006	2938.2	610	55.2	77.5	55.2	77.5	55.0	77.0	4890	55.8
2007	3503.0	610	64.1	75.2	64.1	75.2	65.6	75.0	5681	64.9
2008	4677.6	610	85.4	76.7	85.2	76.7	87.3	76.8	7554	86.0
2009	4501.0	610	82.7	77.5	82.7	77.4	84.2	77.8	7256	82.8
2010	4985.4	610	91.7	79.1	91.7	79.1	93.3	79.6	8095	92.4
2011	4029.4	610	73.7	78.5	73.7	78.5	75.4	79.1	6521	74.4
2012	4545.9	610	85.2	79.1	85.2	79.1	84.8	79.7	7543	85.9
2013	4680.9	610	85.8	79.7	85.8	79.7	87.6	80.3	7561	86.3
2014	4579.2	610	83.7	80.0	83.7	80.0	85.7	80.8	7412	84.6

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2003 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External

A. Plant equipment problem/failure					126	
C. Inspection, maintenance or repair combined with refuelling	1350			1093		
D. Inspection, maintenance or repair without refuelling				36		
E. Testing of plant systems or components					2	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				327		
Z. Other					12	
Subtotal	1350	0	0	1456	140	0
Total	1350			1596		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2003 to 2014 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		60
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		21
32. Feedwater and Main Steam System		0
41. Main Generator Systems		42
Total	0	125



## CN-5 QINSHAN 2-2

**Operator:** NPQJVC (NUCLEAR POWER PLANT QINSHAN JOINT VENTURE COMPANY LTD.)

**Contractor:** CNNC (CHINA NATIONAL NUCLEAR CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 610.0 MW(e)  
**Design Net Capacity:** 610.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 4626.2 GW(e)·h  
**Energy Availability Factor:** 85.0%  
**Load Factor:** 86.6%  
**Operating Factor:** 85.8%  
**Energy Unavailability Factor:** 15.0%  
**Total Off-line Time:** 1246 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	457.1	410.9	466.8	447.8	461.7	149.7	43.6	457.0	344.0	466.3	453.8	467.5	4626.2
<b>EAF (%)</b>	100.0	99.8	100.0	100.0	100.0	34.1	10.8	100.0	76.1	100.0	100.0	99.7	85.0
<b>UCF (%)</b>	100.0	99.8	100.0	100.0	100.0	34.1	10.8	100.0	76.1	100.0	100.0	99.7	85.0
<b>LF (%)</b>	100.7	100.2	102.9	102.0	101.7	34.1	9.6	100.7	78.3	102.8	103.3	103.0	86.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	33.6	17.6	100.0	78.5	100.0	100.0	100.0	85.8
<b>EUf (%)</b>	0.0	0.2	0.0	0.0	0.0	65.9	89.2	0.0	23.9	0.0	0.0	0.3	15.0
<b>PUf (%)</b>	0.0	0.2	0.0	0.0	0.0	65.9	89.2	0.0	0.0	0.0	0.0	0.3	13.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.9	0.0	0.0	0.0	2.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT 2 OPERATION AT FULL POWER IN THE BASE LOAD MODE IN 2014 YEAR, FROM 2014-6-11 TO 2014-7-26 , MAINTENANCE WITH 210 REFUELLING OUTAGE&#65292;THERE ARE ONE UNPLANNED AUTOMATIC SCRAM DUE TO MAIN CONDENSER VACUUM DETERIORATION AT 2014-9-12 3:51.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1997 **Lifetime Generation:** 50772.2 GW(e)·h  
**Date of First Criticality:** 25 Feb 2004 **Cumulative Energy Availability Factor:** 87.0%  
**Date of Grid Connection:** 11 Mar 2004 **Cumulative Load Factor:** 88.6%  
**Date of Commercial Operation:** 03 May 2004 **Cumulative Unit Capability Factor:** 87.0%  
**Cumulative Energy Unavailability Factor:** 13.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2004	3514.3	610	96.2	96.2	96.2	96.2	98.0	98.0	5682	96.6
2005	4521.5	610	82.8	88.2	82.7	88.1	84.6	90.0	7331	83.7
2006	4790.4	610	88.8	88.4	88.8	88.4	89.6	89.9	7822	89.3
2007	4817.0	610	88.3	88.4	88.3	88.4	90.1	89.9	7792	88.9
2008	4635.5	610	85.2	87.7	84.9	87.6	86.5	89.2	7545	85.9
2009	4787.8	610	88.2	87.8	88.2	87.7	89.6	89.3	7821	89.3
2010	4715.0	610	86.6	87.6	86.6	87.6	88.2	89.1	7645	87.3
2011	4960.2	610	90.9	88.0	90.9	88.0	92.8	89.6	8014	91.5
2012	4335.5	610	79.6	87.1	79.6	87.0	80.9	88.6	7072	80.5
2013	4818.5	610	88.7	87.2	88.7	87.2	90.2	88.8	7826	89.3
2014	4626.2	610	85.0	87.0	85.0	87.0	86.6	88.6	7514	85.8

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2004 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		162			94	
C. Inspection, maintenance or repair combined with refuelling	1261			797		
D. Inspection, maintenance or repair without refuelling				34		

G. Major back-fitting, refurbishment or upgrading activities without refuelling				8		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Subtotal	1261	162	0	839	94	1
Total	1423			934		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2004 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		9
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries	162	79
32. Feedwater and Main Steam System		0
42. Electrical Power Supply Systems		2
Total	162	92

## CN-14 QINSHAN 2-3

**Operator:** NPQJVC (NUCLEAR POWER PLANT QINSHAN JOINT VENTURE COMPANY LTD.)

**Contractor:** CNNC (CHINA NATIONAL NUCLEAR CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 619.0 MW(e)  
**Design Net Capacity:** 619.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 4929.3 GW(e)·h  
**Energy Availability Factor:** 92.0%  
**Load Factor:** 90.9%  
**Operating Factor:** 92.2%  
**Energy Unavailability Factor:** 8.0%  
**Total Off-line Time:** 682 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	456.9	406.9	460.4	449.2	446.1	448.1	456.5	449.1	444.1	393.3	52.4	466.3	4929.3
<b>EAF (%)</b>	100.0	99.6	100.0	100.0	100.0	100.0	99.1	99.5	100.0	87.1	17.7	100.0	92.0
<b>UCF (%)</b>	100.0	99.6	100.0	100.0	100.0	100.0	100.0	99.5	100.0	87.1	17.7	100.0	92.1
<b>LF (%)</b>	99.2	97.8	100.0	100.8	96.9	100.6	99.1	97.5	99.6	85.4	11.8	101.3	90.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.4	18.3	100.0	92.2
<b>EUUF (%)</b>	0.0	0.4	0.0	0.0	0.0	0.0	0.9	0.5	0.0	12.9	82.3	0.0	8.0
<b>PUF (%)</b>	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.5	0.0	12.9	82.3	0.0	7.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT 3 OPERATION AT FULL POWER IN THE BASE LOAD MODE IN 2014 YEAR.FROM 2014-10-28 TO 2014-11-25 , 304 REFUELLING OUTAGE.THE SIGNIFICANT FACTORS AFFECTING ENERGY GENERATION IS FOLLOWS:1&#65289;SEVERAL POWER LOAD REDUCTION DUE TO GRID DEMANDS 2&#65289;304 REFUELLING OUTAGE&#65307;3&#65289;SEVERAL PLANNED POWER REDUCED TO DO TURBINE VALVE TESTING.

### 5. Historical Summary

**Date of Construction Start:** 28 Apr 2006 **Lifetime Generation:** 20751.5 GW(e)·h  
**Date of First Criticality:** 13 Jul 2010 **Cumulative Energy Availability Factor:** 89.6%  
**Date of Grid Connection:** 01 Aug 2010 **Cumulative Load Factor:** 90.2%  
**Date of Commercial Operation:** 05 Oct 2010 **Cumulative Unit Capability Factor:** 89.6%  
**Cumulative Energy Unavailability Factor:** 10.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2010	1301.8	610	94.7	94.7	94.7	94.7	96.7	96.7	2154	97.6
2011	4434.1	610	81.6	84.2	81.5	84.2	83.0	85.7	7226	82.5
2012	4846.8	610	90.1	86.8	90.1	86.8	90.5	87.8	7977	90.8
2013	5076.2	610	93.5	88.9	93.5	88.8	95.0	90.0	8243	94.1
2014	4929.3	619	92.1	89.6	92.0	89.6	90.9	90.2	8078	92.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2010 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					19	
C. Inspection, maintenance or repair combined with refuelling	829			566		
L. Human factor related					1	
Subtotal	829	0	0	566	20	0
Total	829			586		

### 7. Equipment Related Full Outages, Analysis by System

System	2014	2010 to 2014
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System	Hours Lost	Average Hours Lost Per Year
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		5
42. Electrical Power Supply Systems		8
Total	0	18

## CN-15 QINSHAN 2-4

**Operator:** NPQJVC (NUCLEAR POWER PLANT QINSHAN JOINT VENTURE COMPANY LTD.)

**Contractor:** CNNC (CHINA NATIONAL NUCLEAR CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 610.0 MW(e)  
**Design Net Capacity:** 619.0 MW(e)  
**Design Discharge Burnup:** 50000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 4844.5 GW(e)·h  
**Energy Availability Factor:** 88.9%  
**Load Factor:** 90.7%  
**Operating Factor:** 90.2%  
**Energy Unavailability Factor:** 11.1%  
**Total Off-line Time:** 855 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	440.7	49.8	266.7	453.4	467.8	449.4	460.2	453.4	438.1	459.8	443.1	461.9	4844.5
<b>EAF (%)</b>	94.4	11.0	56.1	100.0	100.0	99.5	99.5	100.0	99.8	100.0	100.0	100.0	88.9
<b>UCF (%)</b>	100.0	14.1	56.1	100.0	100.0	99.5	100.0	100.0	99.8	100.0	100.0	100.0	89.6
<b>LF (%)</b>	97.1	12.2	58.8	103.2	103.1	102.3	101.4	99.9	99.8	101.3	100.9	101.8	90.7
<b>OF (%)</b>	100.0	14.3	62.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.2
<b>EUf (%)</b>	5.6	89.0	43.9	0.0	0.0	0.5	0.5	0.0	0.2	0.0	0.0	0.0	11.1
<b>PUf (%)</b>	0.0	85.9	29.8	0.0	0.0	0.5	0.0	0.0	0.2	0.0	0.0	0.0	9.2
<b>UCLF (%)</b>	0.0	0.0	14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
<b>XUF (%)</b>	5.6	3.1	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

FROM 2014-2-5 TO 2014-3-8, 402 REFUELLING OUTAGE.FROM 2014-3-25 TO 2014-3-30, UNIT 4  
 MAINTENANCE OUTAGE DUE TO HIGH TEMPERATURE DEFICIENCY OF TURBINE NO.7# BEARING.

### 5. Historical Summary

**Date of Construction Start:** 28 Jan 2007 **Lifetime Generation:** 14888.7 GW(e)·h  
**Date of First Criticality:** 17 Nov 2011 **Cumulative Energy Availability Factor:** 89.9%  
**Date of Grid Connection:** 25 Nov 2011 **Cumulative Load Factor:** 90.1%  
**Date of Commercial Operation:** 30 Dec 2011 **Cumulative Unit Capability Factor:** 90.2%  
**Cumulative Energy Unavailability Factor:** 10.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2011	242.2	610	100.0	100.0	100.0	100.0	53.4	53.4	511	68.7
2012	5195.8	610	95.8	96.1	95.8	96.1	97.0	93.6	8438	96.1
2013	4591.4	610	84.2	90.4	84.2	90.4	85.9	89.9	7428	84.8
2014	4844.5	610	89.6	90.2	88.9	89.9	90.7	90.1	7905	90.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2012 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	756			443		
D. Inspection, maintenance or repair without refuelling				88		
E. Testing of plant systems or components				27		
Subtotal	756	0	0	558	0	0
Total	756			558		

### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2012 to 2014 Average Hours Lost Per Year

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The reactor has not yet completed a full year of commercial operation.

## CN-8 QINSHAN 3-1

**Operator:** TQNPC (The Third Qinshan Jointed Venture Company Ltda.)

**Contractor:** AECL (ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 650.0 MW(e)  
**Design Net Capacity:** 677.0 MW(e)  
**Design Discharge Burnup:** 7186 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 5594.8 GW(e)·h  
**Energy Availability Factor:** 96.2%  
**Load Factor:** 98.3%  
**Operating Factor:** 96.2%  
**Energy Unavailability Factor:** 3.8%  
**Total Off-line Time:** 333 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	496.8	448.7	503.5	485.3	388.6	357.1	483.6	482.1	469.3	488.2	487.0	504.5	5594.8
<b>EAF (%)</b>	99.9	100.0	100.0	99.9	79.1	75.3	100.0	99.8	100.0	100.0	100.0	100.0	96.2
<b>UCF (%)</b>	99.9	100.0	100.0	99.9	79.1	75.3	100.0	99.8	100.0	100.0	100.0	100.0	96.2
<b>LF (%)</b>	102.7	102.7	104.1	103.7	80.4	76.3	100.0	99.7	100.3	100.9	104.1	104.3	98.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.8	100.0	100.0	100.0	74.5	96.2
<b>EUf (%)</b>	0.1	0.0	0.0	0.1	20.9	24.7	0.0	0.2	0.0	0.0	0.0	0.0	3.8
<b>PUf (%)</b>	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.1	20.9	24.7	0.0	0.0	0.0	0.0	0.0	0.0	3.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1.THE UNIT WAS SHUT DOWN FOR MINI OUTAGE TO TROUBLESHOOTING OF PZR MANHOLE COVERING DIAPHRAGM WELDING SEAL DEFICIENCY FROM APRIL 30 TO MAY 8.2.THE UNIT WAS SHUT DOWN FOR MINI OUTAGE DUE TO FAILURE OF THE THIRD STAGE OF PHT PUMP MECHANICAL SEAL FROM JUNE 15 TO 25 .

### 5. Historical Summary

**Date of Construction Start:** 08 Jun 1998 **Lifetime Generation:** 62916.3 GW(e)·h  
**Date of First Criticality:** 21 Sep 2002 **Cumulative Energy Availability Factor:** 89.6%  
**Date of Grid Connection:** 19 Nov 2002 **Cumulative Load Factor:** 91.5%  
**Date of Commercial Operation:** 31 Dec 2002 **Cumulative Unit Capability Factor:** 89.8%  
**Cumulative Energy Unavailability Factor:** 10.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2002			Data not provided							
2003	5174.7	650	89.7	89.7	86.6	86.6	90.9	90.9	7977	91.1
2004	4405.5	650	75.6	82.6	75.6	81.1	77.2	84.0	6745	76.8
2005	4781.6	650	82.5	82.6	82.4	81.5	84.0	84.0	7249	82.8
2006	5577.8	650	96.3	86.0	96.3	85.2	98.0	87.5	8484	96.8
2007	5020.4	650	86.4	86.1	86.4	85.5	88.2	87.6	7597	86.7
2008	5328.6	650	91.2	87.0	91.1	86.4	93.3	88.6	8051	91.7
2009	5326.2	650	91.9	87.7	91.9	87.2	93.5	89.3	8076	92.2
2010	5216.3	650	89.7	87.9	89.7	87.5	91.6	89.6	7884	90.0
2011	5388.5	650	92.5	88.4	92.5	88.1	94.6	90.1	8131	92.8
2012	5544.6	650	96.3	89.2	96.3	88.9	97.1	90.8	8462	96.3
2013	5237.4	650	89.9	89.3	89.9	89.0	92.0	90.9	7949	90.7
2014	5594.8	650	96.2	89.8	96.2	89.6	98.3	91.5	8427	96.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2003 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		313			109	
D. Inspection, maintenance or repair without refuelling				706		

Subtotal	0	313	0	706	109	0
Total	313			815		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2003 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	313	6
12. Reactor I&C Systems		11
15. Reactor Cooling Systems		31
21. Fuel Handling and Storage Facilities		15
32. Feedwater and Main Steam System		3
42. Electrical Power Supply Systems		41
Total	313	107



## CN-9 QINSHAN 3-2

**Operator:** TQNPC (The Third Qinshan Jointed Venture Company Ltda.)

**Contractor:** AECL (ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 650.0 MW(e)  
**Design Net Capacity:** 677.0 MW(e)  
**Design Discharge Burnup:** 7186 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 5223.3 GW(e)·h  
**Energy Availability Factor:** 90.0%  
**Load Factor:** 91.7%  
**Operating Factor:** 90.1%  
**Energy Unavailability Factor:** 10.0%  
**Total Off-line Time:** 868 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	495.6	446.0	502.0	224.8	181.0	470.9	481.6	480.8	465.9	487.4	485.2	502.1	5223.3
<b>EAF (%)</b>	99.8	100.0	100.0	44.5	36.9	99.7	100.0	99.9	99.6	100.0	100.0	100.0	90.0
<b>UCF (%)</b>	99.8	100.0	100.0	44.5	36.9	99.7	100.0	99.9	99.6	100.0	100.0	100.0	90.0
<b>LF (%)</b>	102.5	102.1	103.8	48.0	37.4	100.6	99.6	99.4	99.5	100.8	103.7	103.8	91.7
<b>OF (%)</b>	100.0	100.0	100.0	46.8	34.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.1
<b>EUf (%)</b>	0.2	0.0	0.0	55.5	63.1	0.3	0.0	0.1	0.4	0.0	0.0	0.0	10.0
<b>PUf (%)</b>	0.2	0.0	0.0	55.5	63.1	0.3	0.0	0.1	0.0	0.0	0.0	0.0	10.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1.THE UNIT DISCONNECTED TO GRID AT 01:15 ON APRIL 15 FOR ITS 7TH PLANNED OUTAGE AND RETURNED TO FULL POWER OPERATION AT 14:20 ON MAY 21. 2.THE UNIT DERATION TO 95%FP AT 17:59 ON SEP.21 SO AS TO ISOLATE CONDENSER FOR TROUBLESHOOTING AND SUBSEQUENTLY REACHED FULL POWER OPERATION AT 24:00 ON SEP.30.

### 5. Historical Summary

**Date of Construction Start:** 25 Sep 1998 **Lifetime Generation:** 60234.8 GW(e)·h  
**Date of First Criticality:** 18 Jan 2003 **Cumulative Energy Availability Factor:** 91.1%  
**Date of Grid Connection:** 12 Jun 2003 **Cumulative Load Factor:** 92.3%  
**Date of Commercial Operation:** 24 Jul 2003 **Cumulative Unit Capability Factor:** 91.2%  
**Cumulative Energy Unavailability Factor:** 8.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2003			Data not provided							
2004	5358.6	665	93.0	93.0	92.4	92.4	91.7	91.7	8236	93.8
2005	4604.6	665	80.2	86.6	80.1	86.3	79.0	85.4	7014	80.1
2006	5038.2	650	86.7	86.7	86.7	86.4	88.5	86.4	7721	88.1
2007	5675.7	650	97.6	89.3	97.6	89.2	99.7	89.7	8559	97.7
2008	5083.4	650	87.3	88.9	87.2	88.8	89.0	89.6	7697	87.6
2009	5523.7	650	95.4	90.0	95.4	89.9	97.0	90.8	8359	95.4
2010	5341.5	650	92.1	90.3	92.1	90.2	93.8	91.2	8099	92.5
2011	5261.1	650	91.0	90.4	90.3	90.2	92.4	91.4	7951	90.8
2012	5210.8	650	90.4	90.4	90.4	90.2	91.3	91.4	7980	90.8
2013	5794.1	650	99.9	91.3	99.9	91.2	101.8	92.4	8760	100.0
2014	5223.3	650	90.0	91.2	90.0	91.1	91.7	92.3	7892	90.1

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2004 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					33	
D. Inspection, maintenance or repair without refuelling	748			618		

L. Human factor related					8	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						9
Subtotal	748	0	0	618	41	9
Total	748			668		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2004 to 2014 Average Hours Lost Per Year
14. Safety Systems		15
16. Steam generation systems		4
32. Feedwater and Main Steam System		6
42. Electrical Power Supply Systems		7
Total	0	32

**CN-1 QINSHAN-1****Operator:** CNNO (CNNC Nuclear Operation Management Company Limited.)**Contractor:** CNNC (CHINA NATIONAL NUCLEAR CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 298.0 MW(e)

**Design Net Capacity:** 288.0 MW(e)

**Design Discharge Burnup:** 33000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 2461.1 GW(e)·h

**Energy Availability Factor:** 92.9%

**Load Factor:** 94.3%

**Operating Factor:** 93.8%

**Energy Unavailability Factor:** 7.1%

**Total Off-line Time:** 539 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	227.0	206.6	231.4	223.6	210.1	72.8	223.4	222.3	216.9	229.5	224.0	173.5	2461.1
<b>EAF (%)</b>	99.9	100.0	100.0	99.8	100.0	38.7	100.0	100.0	99.6	100.0	100.0	76.8	92.9
<b>UCF (%)</b>	99.9	100.0	100.0	99.8	100.0	38.7	100.0	100.0	99.6	100.0	100.0	76.8	92.9
<b>LF (%)</b>	102.4	103.2	104.4	104.2	94.8	33.9	100.8	100.2	101.1	103.5	104.4	78.3	94.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	45.6	100.0	100.0	100.0	100.0	100.0	80.2	93.8
<b>EUf (%)</b>	0.1	0.0	0.0	0.2	0.0	61.3	0.0	0.0	0.4	0.0	0.0	23.2	7.1
<b>PUf (%)</b>	0.1	0.0	0.0	0.2	0.0	61.3	0.0	0.0	0.4	0.0	0.0	0.0	5.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.2	2.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

THE 15TH REFUELING OUTAGE WAS FROM 6TH JUN. 2014 TO 24TH JUN. 2014.

**5. Historical Summary**

**Date of Construction Start:** 20 Mar 1985      **Lifetime Generation:** 45301.5 GW(e)·h

**Date of First Criticality:** 31 Oct 1991      **Cumulative Energy Availability Factor:** 80.6%

**Date of Grid Connection:** 15 Dec 1991      **Cumulative Load Factor:** 81.8%

**Date of Commercial Operation:** 01 Apr 1994      **Cumulative Unit Capability Factor:** 81.9%

**Cumulative Energy Unavailability Factor:** 19.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1994	1153.9	279	67.5	67.5	62.0	62.0	62.7	62.7	4624	70.1
1995	2063.9	300	86.8	78.8	82.3	74.0	78.5	72.0	7886	90.0
1996	2073.7	279	81.2	79.7	81.2	76.5	84.6	76.5	7479	85.1
1997	2011.7	300	81.8	80.2	76.1	76.4	76.5	76.5	7185	82.0
1998	1149.5	279	48.8	73.8	42.6	69.5	47.0	70.5	4331	49.4
1999	680.9	279	27.8	66.0	27.8	62.4	27.9	63.3	2519	28.8
2000	2035.5	300	77.6	67.8	77.6	64.8	77.2	65.4	6840	77.9
2001	2319.4	279	93.5	71.0	92.8	68.3	94.9	69.1	8370	95.5
2002	1783.2	279	69.2	70.8	66.3	68.1	73.0	69.5	5989	68.4
2003	2256.6	288	88.5	72.6	88.4	70.2	89.4	71.6	7798	89.0
2004	2565.2	288	99.8	75.2	99.1	72.9	101.4	74.4	8784	100.0
2005	2194.6	288	87.0	76.2	86.8	74.1	87.0	75.5	7693	87.8
2006	2310.4	288	91.8	77.4	91.8	75.5	91.6	76.7	8086	92.3
2007	2061.4	288	82.2	77.8	82.0	75.9	81.7	77.1	7218	82.4
2008	2430.7	288	95.5	79.0	95.4	77.3	96.1	78.4	8434	96.0
2009	2195.4	288	87.4	79.5	87.3	77.9	87.0	78.9	7704	87.9
2010	2169.3	298	83.3	79.8	83.2	78.2	84.3	79.3	7398	84.5
2011	2332.6	298	88.1	80.2	87.9	78.8	89.4	79.9	7762	88.6
2012	2659.1	298	99.9	81.3	99.8	80.0	101.6	81.1	8784	100.0
2013	2158.8	298	81.0	81.3	80.9	80.0	82.7	81.1	7199	82.2
2014	2461.1	298	92.9	81.9	92.9	80.6	94.3	81.8	8221	93.8

**6. Full Outages, Analysis by Cause**

Outage Cause	2014 Hours Lost			1993 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		147			66	
C. Inspection, maintenance or repair combined with refuelling	392			984		
D. Inspection, maintenance or repair without refuelling				56		
E. Testing of plant systems or components					2	
L. Human factor related					16	
Z. Other					281	1
Subtotal	392	147	0	1040	365	1
Total		539			1406	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1993 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		22
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems	147	2
16. Steam generation systems		0
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		11
33. Circulating Water System		3
35. All other I&C Systems		1
41. Main Generator Systems		1
XX. Miscellaneous Systems		1
Total	147	61

# CN-10 TIANWAN-1

**Operator:** JNPC (Jiangsu Nuclear Power Corporation)

**Contractor:** IZ (Izhorskiye Zavody)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 990.0 MW(e)  
**Design Net Capacity:** 990.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 7766.8 GW(e)·h  
**Energy Availability Factor:** 89.8%  
**Load Factor:** 89.6%  
**Operating Factor:** 90.0%  
**Energy Unavailability Factor:** 10.2%  
**Total Off-line Time:** 872 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	206.4	319.2	742.1	709.3	734.6	712.6	727.8	727.9	708.9	740.0	719.0	719.0	7766.8
<b>EAF (%)</b>	28.6	47.6	100.0	100.0	99.5	100.0	100.0	100.0	99.7	100.0	100.0	99.9	89.8
<b>UCF (%)</b>	28.6	47.6	100.0	100.0	99.5	100.0	100.0	100.0	99.7	100.0	100.0	99.9	89.8
<b>LF (%)</b>	28.0	48.0	100.8	99.5	99.7	100.0	98.8	98.8	99.5	100.5	100.9	97.6	89.6
<b>OF (%)</b>	29.2	48.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0
<b>EUUF (%)</b>	71.4	52.4	0.0	0.0	0.5	0.0	0.0	0.0	0.3	0.0	0.0	0.1	10.2
<b>PUF (%)</b>	71.4	47.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7
<b>UCLF (%)</b>	0.0	4.7	0.0	0.0	0.5	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

UNIT 1 REMAINED IN POWER OPERATION EXCEPT ONE REFUELLING OUTAGE AND 3 UNPLANNED POWER DECREASE. NO AUTOMATIC OR MANUAL SCRAM EVENT OCCURRED, THE DETAILS ARE AS FOLLOWS: AT 17:00 ON 9 JANUARY, THE UNIT POWER BEGAN TO DECREASE. AT 00:37 ON 10 JANUARY, THE UNIT TRIPPED, THE GENERATOR WAS DISCONNECTED FROM THE GRID, AND T107 REFUELING OUTAGE STARTED. AT 08:23 ON 15 FEBRUARY, THE UNIT WAS CONNECTED TO THE GRID AND T107 REFUELING OUTAGE ENDED. AND THEN THE POWER WAS INCREASED. AT 09:41 ON 16 FEBRUARY, THE POWER WAS INCREASED TO 100% NNOM AND THE UNIT REMAINED IN STABLE OPERATION AFTERWARDS.

## 5. Historical Summary

**Date of Construction Start:** 20 Oct 1999  
**Date of First Criticality:** 20 Dec 2005  
**Date of Grid Connection:** 12 May 2006  
**Date of Commercial Operation:** 17 May 2007

**Lifetime Generation:** 57219.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 83.9%  
**Cumulative Load Factor:** 85.5%  
**Cumulative Unit Capability Factor:** 83.9%  
**Cumulative Energy Unavailability Factor:** 16.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2007	4687.0	933	84.7	84.7	84.7	84.7	85.4	85.4	4955	84.3
2008	6116.2	933	71.0	76.5	71.0	76.5	74.6	79.0	6270	71.4
2009	6337.7	933	74.1	75.6	74.1	75.6	77.5	78.4	6553	74.8
2010	7539.6	933	87.0	78.7	87.0	78.7	92.2	82.2	7643	87.2
2011	7470.1	990	86.6	80.5	86.6	80.5	86.1	83.1	7606	86.8
2012	7550.2	990	86.8	81.6	86.8	81.6	86.8	83.8	7635	86.9
2013	7869.0	990	90.7	83.0	90.7	83.0	90.7	84.8	7959	90.9
2014	7766.8	990	89.8	83.9	89.8	83.9	89.6	85.5	7888	90.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2007 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					39	
C. Inspection, maintenance or repair combined with refuelling	840			1015		
D. Inspection, maintenance or repair				173		

without refuelling						
L. Human factor related		31				
Subtotal	840	31	0	1188	39	0
Total	871			1227		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2007 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		7
42. Electrical Power Supply Systems		31
Total	0	38

## CN-11 TIANWAN-2

**Operator:** JNPC (Jiangsu Nuclear Power Corporation)

**Contractor:** IZ (Izhorskiye Zavody)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 990.0 MW(e)  
**Design Net Capacity:** 990.0 MW(e)  
**Design Discharge Burnup:** 47500 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7901.4 GW(e)·h  
**Energy Availability Factor:** 91.1%  
**Load Factor:** 91.1%  
**Operating Factor:** 90.8%  
**Energy Unavailability Factor:** 8.9%  
**Total Off-line Time:** 810 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	739.3	661.5	546.3	135.1	738.7	713.0	728.7	728.6	711.2	738.9	717.9	742.3	7901.4
<b>EAF (%)</b>	100.0	100.0	73.7	18.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.1
<b>UCF (%)</b>	100.0	100.0	73.7	18.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.1
<b>LF (%)</b>	100.4	99.4	74.2	18.9	100.3	100.0	98.9	98.9	99.8	100.3	100.7	100.8	91.1
<b>OF (%)</b>	100.0	100.0	74.2	14.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.8
<b>EUf (%)</b>	0.0	0.0	26.3	81.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9
<b>PUf (%)</b>	0.0	0.0	26.3	81.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IN 2014, UNIT 2 REMAINED IN POWER OPERATION WITHOUT AUTOMATIC AND MANUAL SCRAM EVENTS EXCEPT ONE REFUELING OUTAGE AND 1 POWER DECREASE CAUSED BY GRID FAILURE. THE DETAILS ARE AS FOLLOWS: AT 17:00 ON MARCH 23, THE UNIT POWER BEGAN TO DECREASE. AT 00:30 ON MARCH 24, THE UNIT WAS SHUT DOWN, THE GENERATOR WAS DISCONNECTED FROM THE GRID, AND T207 REFUELING OUTAGE STARTED. AT 18:27 ON APRIL 24, THE TURBINE GENERATOR WAS CONNECTED TO THE GRID AND T207 REFUELING OUTAGE ENDED. AT 16:20 ON APRIL 26, THE REACTOR POWER WAS INCREASED TO FULL POWER.

### 5. Historical Summary

**Date of Construction Start:** 20 Sep 2000  
**Date of First Criticality:** 01 May 2007  
**Date of Grid Connection:** 14 May 2007  
**Date of Commercial Operation:** 16 Aug 2007

**Lifetime Generation:** 55880.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 86.5%  
**Cumulative Load Factor:** 88.3%  
**Cumulative Unit Capability Factor:** 86.5%  
**Cumulative Energy Unavailability Factor:** 13.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2007	3459.0	958	100.0	100.0	100.0	100.0	101.0	101.0	3586	97.7
2008	7003.0	933	81.2	86.7	81.2	86.7	85.4	90.0	7193	81.9
2009	6943.4	933	80.7	84.2	80.7	84.2	85.0	87.9	7054	80.5
2010	7131.1	933	82.3	83.7	82.3	83.7	87.3	87.7	7260	82.9
2011	7546.2	990	87.1	84.5	87.1	84.5	87.0	87.6	7658	87.4
2012	7640.1	990	87.8	85.1	87.8	85.1	87.9	87.6	7722	87.9
2013	7741.5	990	89.1	85.8	89.1	85.8	89.3	87.9	7837	89.5
2014	7901.4	990	91.1	86.5	91.1	86.5	91.1	88.3	7950	90.8

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2008 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	761			936		
D. Inspection, maintenance or repair without refuelling				189		
Subtotal	761	0	0	1125	0	0

Total	761	1125
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#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2008 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.



# CN-22 YANGJIANG-1

**Operator:** YJNPC (Yangjiang Nuclear Power Company)

**Contractor:** CFHI (China First Heavy Industries)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1000.0 MW(e)  
**Design Net Capacity:** 1021.0 MW(e)  
**Design Discharge Burnup:** 44000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6793.4 GW(e)·h  
**Energy Availability Factor:** 99.9%  
**Load Factor:** 92.5%  
**Operating Factor:** 92.0%  
**Energy Unavailability Factor:** 0.1%  
**Total Off-line Time:** 591 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h			157.9	736.1	760.2	729.7	741.3	740.3	689.2	726.6	743.0	769.0	6793.4
EAF (%)			100.0	100.0	100.0	100.0	100.0	99.9	100.0	99.6	100.0	100.0	99.9
UCF (%)			100.0	100.0	100.0	100.0	100.0	99.9	100.0	99.6	100.0	100.0	99.9
LF (%)			21.2	102.2	102.2	101.3	99.6	99.5	95.7	97.7	103.2	103.4	92.5
OF (%)			20.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.0
EUF (%)			0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.0	0.0	0.1
PUF (%)			0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
UCLF (%)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0
XUF (%)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

MARCH 25, 2014, YANGJIANG NPP UNIT 1 BEGAN COMMERCIAL OPERATION, UNTIL DECEMBER 31, 2014, FOR NO SHUTDOWN AUTOMATICALLY OR MANUALLY SHUTDOWN EVENT OCCURS.

## 5. Historical Summary

**Date of Construction Start:** 16 Dec 2008 **Lifetime Generation:** 7244.3 GW(e)·h  
**Date of First Criticality:** 23 Dec 2013 **Cumulative Energy Availability Factor:** 99.9%  
**Date of Grid Connection:** 31 Dec 2013 **Cumulative Load Factor:** 92.5%  
**Date of Commercial Operation:** 25 Mar 2014 **Cumulative Unit Capability Factor:** 99.9%  
**Cumulative Energy Unavailability Factor:** 0.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2014	6793.4	1000	99.9	99.9	99.9	99.9	92.5	92.5	6753	92.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2014 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External

The reactor has not yet completed a full year of commercial operation.

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2014 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

## CZ-4 DUKOVANY-1

Operator: CEZ (Czech Power Co., CEZ a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 468.0 MW(e)  
 Design Net Capacity: 420.0 MW(e)  
 Design Discharge Burnup: 44000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3785.5 GW(e)·h  
 Energy Availability Factor: 91.7%  
 Load Factor: 92.3%  
 Operating Factor: 92.9%  
 Energy Unavailability Factor: 8.3%  
 Total Off-line Time: 619 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	353.0	316.1	350.6	337.6	347.3	333.3	340.1	340.8	47.0	330.9	338.0	350.8	3785.5
EAF (%)	100.0	99.8	99.7	99.1	99.2	98.6	97.5	97.6	14.4	94.2	99.8	100.0	91.7
UCF (%)	100.0	100.0	99.9	99.4	100.0	100.0	100.0	100.0	15.3	94.9	100.0	100.0	92.5
LF (%)	101.4	100.5	100.8	100.2	99.7	98.9	97.7	97.9	14.0	94.9	100.3	100.8	92.3
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	15.8	98.3	100.0	100.0	92.9
EUf (%)	0.0	0.2	0.3	0.9	0.8	1.4	2.5	2.4	85.6	5.8	0.2	0.0	8.3
PUf (%)	0.0	0.0	0.1	0.6	0.0	0.0	0.0	0.0	84.7	5.0	0.0	0.0	7.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.2	0.2	0.2	0.8	1.4	2.5	2.4	0.9	0.7	0.2	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ALL FOUR DUKOVANY'S UNITS OPERATED ON STANDARD PARAMETERS FOLLOWING THE AGREED POWER PROFILE AND REQUIREMENTS OF CEZ POWER DISPATCHING.

### 5. Historical Summary

Date of Construction Start: 01 Jan 1979      Lifetime Generation: 92755.0 GW(e)·h  
 Date of First Criticality: 12 Feb 1985      Cumulative Energy Availability Factor: 84.2%  
 Date of Grid Connection: 24 Feb 1985      Cumulative Load Factor: 85.2%  
 Date of Commercial Operation: 03 May 1985      Cumulative Unit Capability Factor: 85.0%  
    Cumulative Energy Unavailability Factor: 15.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	1993.9	396	88.1	88.1	88.1	88.1	86.7	86.7	5178	88.1
1986	2658.4	403	76.1	80.9	76.1	80.8	75.3	79.8	7094	81.0
1987	2575.9	408	74.7	78.5	70.7	77.0	72.1	76.9	6867	78.4
1988	2524.0	408	74.2	77.3	71.5	75.5	70.4	75.1	6996	79.6
1989	2940.6	408	82.6	78.5	82.0	76.9	82.3	76.6	7579	86.5
1990	2965.6	408	84.3	79.5	82.5	77.9	83.0	77.8	7658	87.4
1991	2581.1	408	70.7	78.2	70.5	76.8	72.2	76.9	6751	77.1
1992	3172.8	408	80.9	78.5	80.5	77.3	88.5	78.5	7537	85.8
1993	3239.7	442	83.7	79.2	83.7	78.1	83.7	79.1	7649	87.3
1994	3278.5	442	84.6	79.8	84.6	78.8	84.7	79.7	7656	87.4
1995	2966.1	442	76.8	79.5	76.8	78.6	76.6	79.4	7022	80.2
1996	3144.6	412	86.0	80.0	85.4	79.2	86.9	80.0	7592	86.4
1997	3295.6	440	86.8	80.6	85.3	79.7	85.5	80.5	7678	87.6
1998	2973.4	412	85.4	80.9	82.6	79.9	82.4	80.6	7518	85.8
1999	2901.1	412	79.8	80.9	79.2	79.8	80.4	80.6	7034	80.3
2000	3327.9	412	89.8	81.4	89.7	80.5	92.0	81.3	7934	90.3
2001	3328.9	412	90.6	82.0	90.2	81.0	92.2	82.0	7996	91.3
2002	3267.5	412	89.6	82.4	88.9	81.5	90.5	82.5	7926	90.5
2003	3032.0	412	82.9	82.4	82.6	81.5	84.0	82.5	7261	82.9
2004	3035.5	412	83.6	82.5	82.9	81.6	83.9	82.6	7349	83.7
2005	3324.5	412	91.3	82.9	90.6	82.0	92.1	83.1	8015	91.5
2006	3271.6	412	91.2	83.3	89.7	82.4	90.6	83.4	8014	91.5

2007	2967.3	427	81.4	83.2	80.9	82.3	81.7	83.3	7198	82.2
2008	3485.3	427	91.8	83.6	91.6	82.7	92.9	83.8	8090	92.1
2009	3518.6	427	92.7	84.0	92.5	83.1	94.1	84.2	8186	93.4
2010	3573.8	427	94.0	84.4	93.8	83.6	95.5	84.6	8256	94.2
2011	2939.0	468	77.3	84.1	76.9	83.3	77.9	84.4	6877	78.5
2012	3733.4	468	91.1	84.4	90.2	83.6	90.8	84.6	8049	91.6
2013	3778.6	468	92.6	84.7	91.7	83.9	92.2	84.9	8142	92.9
2014	3785.5	468	92.5	85.0	91.7	84.2	92.3	85.2	8141	92.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					51	
C. Inspection, maintenance or repair combined with refuelling	619			1040		
D. Inspection, maintenance or repair without refuelling				90		
J. Grid limitation, failure or grid unavailability						5
L. Human factor related					0	
Subtotal	619	0	0	1130	51	5
Total		619			1186	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		3
14. Safety Systems		7
15. Reactor Cooling Systems		16
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems		15
Total	0	48

## CZ-5 DUKOVANY-2

Operator: CEZ (Czech Power Co., CEZ a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 471.0 MW(e)  
 Design Net Capacity: 420.0 MW(e)  
 Design Discharge Burnup: 44000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3672.6 GW(e)·h  
 Energy Availability Factor: 89.2%  
 Load Factor: 89.0%  
 Operating Factor: 91.7%  
 Energy Unavailability Factor: 10.8%  
 Total Off-line Time: 727 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	349.2	312.6	302.6	11.6	342.2	329.2	336.9	340.3	329.4	341.8	331.5	345.5	3672.6
EAF (%)	99.6	99.0	86.7	3.7	97.8	97.3	96.5	97.3	97.2	97.8	98.1	98.9	89.2
UCF (%)	100.0	100.0	91.8	3.7	99.9	100.0	100.0	100.0	99.0	100.0	98.7	99.6	91.1
LF (%)	99.6	98.8	86.5	3.4	97.6	97.1	96.1	97.1	97.1	97.4	97.7	98.6	89.0
OF (%)	100.0	100.0	92.9	6.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.7
EUf (%)	0.4	1.0	13.3	96.3	2.2	2.7	3.5	2.7	2.8	2.2	1.9	1.1	10.8
PUf (%)	0.0	0.0	7.7	94.8	0.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	8.5
UCLF (%)	0.0	0.0	0.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.5	0.3
XUF (%)	0.4	1.0	5.1	0.0	2.1	2.7	3.5	2.7	1.8	2.2	0.6	0.7	1.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Jan 1979      Lifetime Generation: 90044.0 GW(e)·h  
 Date of First Criticality: 23 Jan 1986      Cumulative Energy Availability Factor: 84.3%  
 Date of Grid Connection: 30 Jan 1986      Cumulative Load Factor: 85.1%  
 Date of Commercial Operation: 21 Mar 1986      Cumulative Unit Capability Factor: 85.1%  
    Cumulative Energy Unavailability Factor: 15.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	2693.7	408	94.4	94.4	94.4	94.4	89.9	89.9	6906	94.0
1987	2668.6	408	76.6	84.7	71.6	82.0	74.7	81.6	6997	79.9
1988	2771.3	408	74.9	81.2	74.6	79.4	77.3	80.1	6963	79.3
1989	3011.0	408	82.7	81.6	82.2	80.1	84.2	81.2	7713	88.0
1990	2822.7	408	80.1	81.3	76.5	79.4	79.0	80.7	7566	86.4
1991	2901.4	408	81.6	81.3	81.2	79.7	81.2	80.8	7600	86.8
1992	2830.6	408	71.6	79.9	71.4	78.5	79.0	80.5	6551	74.6
1993	3256.9	440	84.2	80.5	84.2	79.2	84.5	81.1	7496	85.6
1994	3094.3	440	80.8	80.5	79.6	79.3	80.3	81.0	7315	83.5
1995	3263.3	440	85.5	81.1	84.3	79.8	84.7	81.4	7720	88.1
1996	2831.0	412	78.3	80.8	77.3	79.6	78.2	81.1	6917	78.7
1997	3144.8	440	81.1	80.8	81.1	79.7	81.6	81.1	7179	82.0
1998	3209.2	412	88.2	81.4	87.7	80.3	88.9	81.7	7803	89.1
1999	3198.1	412	88.4	81.9	87.8	80.9	88.6	82.2	7812	89.2
2000	2954.1	412	81.8	81.9	81.2	80.9	81.6	82.2	7223	82.2
2001	3121.1	412	86.9	82.2	86.4	81.2	86.5	82.4	7646	87.3
2002	3159.6	412	88.3	82.6	87.8	81.6	87.5	82.7	7716	88.1
2003	3252.6	412	89.8	83.0	89.2	82.0	90.1	83.2	7939	90.6
2004	3087.7	412	84.4	83.0	84.2	82.2	85.3	83.3	7439	84.7
2005	3313.2	412	91.3	83.5	90.8	82.6	91.8	83.7	8048	91.9
2006	3294.7	412	91.1	83.8	90.6	83.0	91.3	84.1	8017	91.5
2007	3274.7	412	90.9	84.1	90.1	83.3	90.7	84.4	7983	91.1
2008	3040.4	427	82.1	84.0	81.6	83.2	82.0	84.3	7228	82.3
2009	3507.9	427	93.2	84.4	92.8	83.6	93.8	84.7	8209	93.7

2010	3535.9	427	93.8	84.8	93.4	84.0	94.5	85.1	8250	94.2
2011	3254.8	427	86.7	84.9	86.3	84.1	87.0	85.1	7676	87.6
2012	3047.3	471	78.3	84.6	76.8	83.8	76.6	84.8	6918	78.8
2013	3690.6	471	90.6	84.9	89.8	84.1	89.4	85.0	7984	91.1
2014	3672.6	471	91.1	85.1	89.2	84.3	89.0	85.1	8033	91.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		11			34	
C. Inspection, maintenance or repair combined with refuelling	716			1034		
D. Inspection, maintenance or repair without refuelling				81		
E. Testing of plant systems or components					1	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					9	
Subtotal	716	11	0	1115	44	4
Total		727			1163	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		6
15. Reactor Cooling Systems	11	4
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		13
33. Circulating Water System		0
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		0
Total	11	29

## CZ-8 DUKOVANY-3

Operator: CEZ (Czech Power Co., CEZ a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 468.0 MW(e)  
 Design Net Capacity: 420.0 MW(e)  
 Design Discharge Burnup: 44000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3500.0 GW(e)·h  
 Energy Availability Factor: 85.1%  
 Load Factor: 85.4%  
 Operating Factor: 87.2%  
 Energy Unavailability Factor: 14.9%  
 Total Off-line Time: 1121 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	350.1	239.0	75.0	333.8	344.6	330.9	335.8	334.5	331.1	343.4	187.6	294.2	3500.0
EAF (%)	99.9	75.7	22.4	98.4	98.6	97.7	96.4	95.9	97.7	98.7	55.5	84.1	85.1
UCF (%)	100.0	77.0	22.7	100.0	100.0	100.0	100.0	98.7	100.0	100.0	55.9	84.3	86.6
LF (%)	100.6	76.0	21.6	99.1	99.0	98.2	96.4	96.1	98.2	98.5	55.7	84.5	85.4
OF (%)	100.0	77.5	24.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	57.5	85.9	87.2
EUf (%)	0.1	24.3	77.6	1.6	1.4	2.3	3.6	4.1	2.3	1.3	44.5	15.9	14.9
PUf (%)	0.0	23.0	68.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	7.6
UCLF (%)	0.0	0.0	8.8	0.0	0.0	0.0	0.0	1.3	0.0	0.0	44.0	15.7	5.8
XUF (%)	0.1	1.3	0.3	1.6	1.4	2.3	3.6	2.8	2.3	1.3	0.4	0.1	1.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Mar 1979      Lifetime Generation: 88303.0 GW(e)·h  
 Date of First Criticality: 28 Oct 1986      Cumulative Energy Availability Factor: 83.2%  
 Date of Grid Connection: 14 Nov 1986      Cumulative Load Factor: 84.3%  
 Date of Commercial Operation: 20 Dec 1986      Cumulative Unit Capability Factor: 84.8%  
    Cumulative Energy Unavailability Factor: 16.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	253.0	408	100.0	100.0	100.0	100.0	87.6	87.6	744	100.0
1987	3109.9	408	86.4	87.4	84.3	85.5	87.0	87.1	7644	87.3
1988	2988.9	408	81.4	84.5	80.0	82.8	83.4	85.3	7672	87.3
1989	2685.7	408	71.4	80.3	71.0	79.0	75.1	82.0	6678	76.2
1990	2982.0	408	85.0	81.4	80.3	79.3	83.4	82.4	7763	88.6
1991	2987.0	408	81.6	81.4	81.3	79.7	83.6	82.6	7784	88.9
1992	2917.9	408	72.6	80.0	72.3	78.5	81.4	82.4	6678	76.0
1993	3190.5	452	80.5	80.1	80.5	78.8	80.6	82.1	7259	82.9
1994	3343.9	452	84.5	80.7	84.5	79.6	84.5	82.4	7870	89.8
1995	2689.6	452	87.4	81.4	70.0	78.4	67.9	80.7	7788	88.9
1996	2871.2	412	80.4	81.3	78.3	78.4	79.3	80.6	7114	81.0
1997	2904.6	440	75.5	80.8	74.9	78.1	75.4	80.1	6774	77.3
1998	3090.1	412	85.7	81.2	85.0	78.6	85.6	80.5	7564	86.3
1999	3246.2	412	89.9	81.8	89.3	79.4	89.9	81.2	7849	89.6
2000	3187.9	412	88.7	82.3	87.4	80.0	88.1	81.7	7776	88.5
2001	3006.0	412	83.8	82.4	82.7	80.2	83.3	81.8	7309	83.4
2002	3259.4	412	89.9	82.9	89.6	80.7	90.3	82.3	7880	90.0
2003	3280.1	412	90.5	83.3	89.8	81.3	90.9	82.8	7934	90.6
2004	3302.5	412	90.3	83.7	90.2	81.7	91.2	83.3	7957	90.6
2005	2964.9	427	80.0	83.5	79.6	81.6	80.2	83.1	7034	80.3
2006	3396.2	427	90.8	83.9	90.0	82.1	90.8	83.5	8004	91.4
2007	3427.9	427	91.4	84.2	90.9	82.5	91.6	83.9	8068	92.1
2008	3548.8	427	93.7	84.7	93.2	83.0	94.6	84.4	8273	94.2
2009	2944.7	468	74.7	84.2	74.0	82.6	74.0	83.9	6688	76.3

2010	3283.5	468	80.9	84.0	79.9	82.4	80.1	83.7	7146	81.6
2011	3643.9	468	89.9	84.3	89.0	82.7	88.9	84.0	7940	90.6
2012	3691.3	468	91.1	84.6	89.8	83.0	89.8	84.2	8040	91.5
2013	3542.8	468	87.4	84.7	86.4	83.2	86.4	84.3	7714	88.1
2014	3500.0	468	86.6	84.8	85.1	83.2	85.4	84.3	7639	87.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		476			79	
C. Inspection, maintenance or repair combined with refuelling	644			1044		
D. Inspection, maintenance or repair without refuelling				43		
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					3	
Z. Other					6	
Subtotal	644	476	0	1087	88	2
Total		1120			1177	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		7
15. Reactor Cooling Systems	65	28
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System	105	6
33. Circulating Water System	306	
35. All other I&C Systems		0
41. Main Generator Systems		29
42. Electrical Power Supply Systems		3
Total	476	76

## CZ-9 DUKOVANY-4

Operator: CEZ (Czech Power Co., CEZ a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 471.0 MW(e)  
 Design Net Capacity: 420.0 MW(e)  
 Design Discharge Burnup: 44000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3494.8 GW(e)·h  
 Energy Availability Factor: 84.8%  
 Load Factor: 84.7%  
 Operating Factor: 86.7%  
 Energy Unavailability Factor: 15.2%  
 Total Off-line Time: 1169 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	326.0	315.6	347.6	335.8	343.8	331.2	336.3	340.4	331.9	342.8	143.3	0.0	3494.8
EAF (%)	92.8	99.8	99.2	98.9	98.4	97.7	96.4	97.3	97.8	98.5	42.0	0.0	84.8
UCF (%)	92.8	99.9	99.5	100.0	100.0	100.0	99.7	99.9	100.0	100.0	42.2	0.0	86.1
LF (%)	93.0	99.7	99.3	99.0	98.1	97.7	96.0	97.1	97.9	97.7	42.3	0.0	84.7
OF (%)	96.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	44.9	0.0	86.7
EUf (%)	7.2	0.2	0.8	1.1	1.6	2.3	3.6	2.7	2.2	1.5	58.0	100.0	15.2
PUf (%)	7.2	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8	98.9	9.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0	49.9	1.1	4.2
XUF (%)	0.0	0.1	0.3	1.1	1.6	2.3	3.3	2.6	2.2	1.5	0.2	0.0	1.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Mar 1979      Lifetime Generation: 87269.0 GW(e)·h  
 Date of First Criticality: 01 Jun 1987      Cumulative Energy Availability Factor: 84.1%  
 Date of Grid Connection: 11 Jun 1987      Cumulative Load Factor: 85.5%  
 Date of Commercial Operation: 19 Jul 1987      Cumulative Unit Capability Factor: 85.0%  
    Cumulative Energy Unavailability Factor: 15.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	1596.5	408	99.9	99.9	98.2	98.2	88.6	88.6	4117	93.2
1988	2764.0	408	74.5	83.0	73.8	82.0	77.1	81.0	7092	80.7
1989	2984.5	408	80.8	82.1	80.4	81.3	83.5	82.0	7314	83.5
1990	2995.3	408	82.8	82.3	80.0	80.9	83.8	82.5	7836	89.5
1991	2672.0	408	78.0	81.3	77.9	80.3	74.8	80.8	7301	83.3
1992	3328.4	408	84.5	81.9	83.7	80.9	92.9	83.0	7614	86.7
1993	2939.8	448	62.1	78.6	62.1	77.8	74.9	81.6	6859	78.3
1994	3259.8	448	84.5	79.5	83.1	78.5	83.1	81.8	7538	86.1
1995	3311.1	448	85.5	80.2	85.3	79.4	84.4	82.2	7712	88.0
1996	3202.1	412	88.2	81.0	87.1	80.2	88.5	82.8	7762	88.4
1997	3149.2	440	80.9	81.0	80.9	80.2	81.7	82.7	7202	82.2
1998	3078.6	412	85.7	81.4	83.8	80.5	85.3	82.9	7536	86.0
1999	3179.4	412	88.6	82.0	86.6	81.0	88.1	83.3	7792	88.9
2000	3234.5	412	89.5	82.5	88.1	81.5	89.4	83.8	7839	89.2
2001	3258.1	412	90.4	83.1	89.2	82.1	90.3	84.2	7946	90.7
2002	2748.2	412	77.3	82.7	75.6	81.6	76.1	83.7	6745	77.0
2003	3309.8	412	91.4	83.2	90.7	82.2	91.7	84.2	8009	91.4
2004	3335.4	412	91.1	83.6	90.9	82.7	92.2	84.6	8029	91.4
2005	3267.0	412	90.3	84.0	89.6	83.0	90.5	84.9	8008	91.4
2006	3159.5	412	87.8	84.2	86.9	83.2	87.5	85.1	7704	87.9
2007	3319.0	427	88.7	84.4	88.1	83.5	88.7	85.3	7854	89.7
2008	3438.7	427	90.7	84.7	90.3	83.8	91.7	85.6	8010	91.2
2009	3100.5	427	82.0	84.6	81.8	83.7	82.9	85.4	7247	82.7
2010	2895.1	427	77.3	84.3	76.7	83.4	77.4	85.1	6846	78.2



2011	3630.7	471	89.9	84.5	88.8	83.7	88.0	85.2	8001	91.3
2012	3621.0	471	88.8	84.7	87.6	83.8	87.5	85.3	7850	89.4
2013	3727.9	471	91.4	85.0	90.5	84.1	90.4	85.5	8009	91.4
2014	3494.8	471	86.1	85.0	84.8	84.1	84.7	85.5	7591	86.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		353			27	
C. Inspection, maintenance or repair combined with refuelling	815			938		
D. Inspection, maintenance or repair without refuelling				66		
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						3
L. Human factor related					8	
Subtotal	815	353	0	1004	35	7
Total		1168			1046	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		4
14. Safety Systems		6
15. Reactor Cooling Systems		6
17. Safety I&C Systems (excluding reactor I&C)	8	
32. Feedwater and Main Steam System		7
33. Circulating Water System	345	0
35. All other I&C Systems		1
42. Electrical Power Supply Systems		0
Total	353	24

**CZ-23 TEMELIN-1****Operator:** CEZ (Czech Power Co., CEZ a.s.)**Contractor:** SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1003.0 MW(e)

**Design Net Capacity:** 912.0 MW(e)

**Design Discharge Burnup:** 45000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 7194.6 GW(e)·h

**Energy Availability Factor:** 80.8%

**Load Factor:** 81.3%

**Operating Factor:** 81.0%

**Energy Unavailability Factor:** 19.2%

**Total Off-line Time:** 1668 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	751.0	678.2	751.3	726.1	749.9	645.6	0.0	19.5	735.4	761.6	746.3	629.7	7194.6
<b>EAF (%)</b>	100.0	100.0	100.0	99.8	100.0	89.4	0.0	3.4	99.6	99.2	100.0	81.7	80.8
<b>UCF (%)</b>	100.0	100.0	100.0	99.9	100.0	89.4	0.0	3.4	99.6	99.2	100.0	81.7	80.9
<b>LF (%)</b>	100.6	100.6	100.8	100.5	100.5	89.4	0.0	2.6	99.8	99.9	101.3	82.7	81.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	89.6	0.0	4.4	100.0	99.5	100.0	82.0	81.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.2	0.0	10.6	100.0	96.6	0.4	0.8	0.0	18.3	19.2
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	10.6	100.0	96.6	0.4	0.8	0.0	17.3	19.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 01 Feb 1987      **Lifetime Generation:** 79520.0 GW(e)·h

**Date of First Criticality:** 11 Oct 2000      **Cumulative Energy Availability Factor:** 72.5%

**Date of Grid Connection:** 21 Dec 2000      **Cumulative Load Factor:** 72.8%

**Date of Commercial Operation:** 10 Jun 2002      **Cumulative Unit Capability Factor:** 72.6%

**Cumulative Energy Unavailability Factor:** 27.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2002	3675.8	930	76.1	76.1	76.1	76.1	77.0	77.0	4233	82.4
2003	5455.3	912	65.3	69.3	65.3	69.3	68.3	71.5	5861	66.9
2004	5715.8	950	68.1	68.8	68.0	68.8	68.5	70.3	6029	68.6
2005	5444.0	950	66.3	68.1	66.3	68.1	66.4	69.2	5846	66.7
2006	6124.9	930	75.7	69.8	75.7	69.8	75.2	70.5	6731	76.8
2007	4901.4	963	60.0	68.0	60.0	68.0	59.6	68.6	5282	60.3
2008	4526.4	963	53.6	65.8	53.5	65.7	53.5	66.2	4745	54.0
2009	6229.8	963	73.9	66.9	73.8	66.8	73.8	67.2	6527	74.5
2010	6305.6	963	74.8	67.8	74.5	67.7	74.7	68.1	6594	75.3
2011	6915.6	963	81.8	69.3	81.8	69.2	82.0	69.6	7205	82.2
2012	7159.8	963	85.0	70.8	84.7	70.7	84.6	71.0	7515	85.6
2013	7018.7	1003	82.3	71.8	82.2	71.7	82.1	72.0	7252	82.8
2014	7194.6	1023	80.9	72.6	80.8	72.5	81.3	72.8	7092	81.0

**6. Full Outages, Analysis by Cause**

Outage Cause	2014 Hours Lost			2001 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		7			558	
C. Inspection, maintenance or repair combined with refuelling	1530			1356		
D. Inspection, maintenance or repair without refuelling	126			14		
E. Testing of plant systems or components	4			44	1	

L. Human factor related					76	
M. Governmental requirements or court decisions					47	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				95		
Subtotal	1660	7	0	1509	682	0
Total	1667			2191		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2001 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		59
12. Reactor I&C Systems		16
15. Reactor Cooling Systems		109
16. Steam generation systems		16
31. Turbine and auxiliaries	7	259
32. Feedwater and Main Steam System		28
33. Circulating Water System		3
41. Main Generator Systems		63
42. Electrical Power Supply Systems		2
Total	7	555

## CZ-24 TEMELIN-2

Operator: CEZ (Czech Power Co., CEZ a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1003.0 MW(e)  
 Design Net Capacity: 912.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6989.2 GW(e)·h  
 Energy Availability Factor: 79.3%  
 Load Factor: 79.5%  
 Operating Factor: 79.7%  
 Energy Unavailability Factor: 20.7%  
 Total Off-line Time: 1780 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	751.8	385.1	749.3	599.3	0.0	401.0	593.1	746.9	725.6	752.4	535.6	749.2	6989.2
EAF (%)	100.0	56.9	100.0	82.8	0.0	56.0	79.7	100.0	100.0	100.0	74.1	100.0	79.3
UCF (%)	100.0	57.0	100.0	82.8	0.0	56.1	79.8	100.0	100.0	100.0	74.1	100.0	79.3
LF (%)	100.8	57.1	100.6	83.0	0.0	55.5	79.5	100.1	100.5	100.7	74.2	100.4	79.5
OF (%)	100.0	57.3	100.0	82.9	0.0	59.3	80.0	100.0	100.0	100.0	74.4	100.0	79.7
EUf (%)	0.0	43.1	0.0	17.2	100.0	44.0	20.3	0.0	0.0	0.0	25.9	0.0	20.7
PUf (%)	0.0	0.0	0.0	17.2	100.0	44.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5
UCLF (%)	0.0	43.1	0.0	0.0	0.0	0.0	20.2	0.0	0.0	0.0	25.9	0.0	7.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Feb 1987      Lifetime Generation: 77391.0 GW(e)·h  
 Date of First Criticality: 31 May 2002      Cumulative Energy Availability Factor: 77.9%  
 Date of Grid Connection: 29 Dec 2002      Cumulative Load Factor: 78.2%  
 Date of Commercial Operation: 18 Apr 2003      Cumulative Unit Capability Factor: 78.2%  
    Cumulative Energy Unavailability Factor: 22.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2003	5329.8	930	84.6	84.6	84.6	84.6	86.8	86.8	5748	87.1
2004	6340.1	950	75.2	79.2	75.2	79.2	76.0	80.6	6678	76.0
2005	4941.4	950	65.3	74.4	65.1	74.3	65.3	75.3	6135	70.0
2006	5251.9	780	65.8	72.1	65.3	71.9	65.4	72.7	5765	65.8
2007	6745.1	963	80.1	73.8	79.9	73.7	80.5	74.4	7051	80.5
2008	6978.7	963	83.2	75.5	82.6	75.3	82.5	75.8	7420	84.5
2009	6363.2	963	76.8	75.7	75.4	75.3	75.4	75.8	6756	77.1
2010	6847.3	963	81.1	76.4	80.9	76.0	81.2	76.5	7135	81.5
2011	6311.6	963	74.9	76.2	74.8	75.9	74.8	76.3	6589	75.2
2012	7349.9	963	86.9	77.4	86.8	77.0	86.9	77.4	7656	87.2
2013	7246.8	1003	84.8	78.1	84.5	77.8	84.4	78.1	7448	85.0
2014	6989.2	1003	79.3	78.2	79.3	77.9	79.5	78.2	6980	79.7

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2002 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		620			349	
C. Inspection, maintenance or repair combined with refuelling	1160			1110		
D. Inspection, maintenance or repair without refuelling				69		
E. Testing of plant systems or components				30	4	
J. Grid limitation, failure or grid						0

unavailability						
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					44	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Subtotal	1160	620	0	1209	397	1
Total	1780			1607		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2002 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		88
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems	287	
15. Reactor Cooling Systems		27
16. Steam generation systems		26
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		57
32. Feedwater and Main Steam System	184	18
33. Circulating Water System	149	
35. All other I&C Systems		46
41. Main Generator Systems		35
42. Electrical Power Supply Systems		38
Total	620	346

# FI-1 LOVIISA-1

**Operator:** FORTUMPH (FORTUM POWER AND HEAT OY (former IVO))

**Contractor:** AEE (ATOMENERGOEXPORT)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 496.0 MW(e)  
**Design Net Capacity:** 420.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 4010.6 GW(e)·h  
**Energy Availability Factor:** 92.6%  
**Load Factor:** 92.3%  
**Operating Factor:** 94.3%  
**Energy Unavailability Factor:** 7.4%  
**Total Off-line Time:** 498 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	368.8	333.5	368.9	356.3	366.1	352.1	219.1	212.4	342.9	365.9	355.7	369.0	4010.6
<b>EAF (%)</b>	100.0	100.0	100.0	99.9	99.2	98.6	59.4	58.5	97.6	99.6	100.0	100.0	92.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	62.8	59.9	99.4	100.0	100.0	100.0	93.4
<b>LF (%)</b>	99.9	100.0	100.1	99.8	99.2	98.6	59.4	57.6	96.0	99.0	99.6	100.0	92.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	63.0	70.0	100.0	100.0	100.0	100.0	94.3
<b>EUf (%)</b>	0.0	0.0	0.0	0.1	0.8	1.4	40.6	41.5	2.4	0.4	0.0	0.0	7.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	37.2	40.1	0.0	0.0	0.0	0.0	6.6
<b>UCLF (%)</b>	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.6	0.1	0.0	0.0	0.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.1	0.8	1.4	3.5	1.3	1.8	0.4	0.0	0.0	0.8

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE PLANT UNIT OPERATED AT FULL POWER IN BASE LOAD MODE AND UNDERWENT A SO-CALLED SHORT OUTAGE THAT INCLUDED NO EXTENSIVE ALTERATIONS OR REPARATIONS.

## 5. Historical Summary

**Date of Construction Start:** 01 May 1971 **Lifetime Generation:** 133683.8 GW(e)·h  
**Date of First Criticality:** 21 Jan 1977 **Cumulative Energy Availability Factor:** 87.5%  
**Date of Grid Connection:** 08 Feb 1977 **Cumulative Load Factor:** 87.2%  
**Date of Commercial Operation:** 09 May 1977 **Cumulative Unit Capability Factor:** 88.0%  
**Cumulative Energy Unavailability Factor:** 12.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	2118.6	431	83.8	83.8	83.8	83.8	83.8	83.8	5591	95.1
1978	2975.8	430	78.9	80.9	78.9	80.9	79.0	80.9	7531	86.0
1979	2901.7	405	81.8	81.2	81.8	81.2	81.8	81.2	7404	84.5
1980	1407.8	445	36.6	68.5	36.6	68.5	36.0	68.4	3482	39.6
1981	3105.1	440	81.9	71.5	81.9	71.5	80.6	71.0	7642	87.2
1982	3245.4	440	84.2	73.8	84.2	73.8	84.2	73.4	7576	86.5
1983	3337.4	445	86.7	75.7	86.7	75.7	85.6	75.3	7982	91.1
1984	3343.9	445	85.8	77.1	85.8	77.1	85.5	76.7	7653	87.1
1985	3600.0	440	92.5	78.9	92.5	78.9	93.4	78.6	8248	94.2
1986	3522.4	445	91.1	80.2	91.1	80.2	90.4	79.8	8093	92.4
1987	3600.4	445	94.6	81.5	94.6	81.5	92.4	81.0	8257	94.3
1988	3354.6	445	87.0	82.0	87.0	82.0	85.8	81.5	7678	87.4
1989	3575.7	445	92.8	82.9	92.6	82.9	91.7	82.3	8183	93.4
1990	3271.1	445	85.5	83.1	85.5	83.1	83.9	82.4	7605	86.8
1991	3360.9	445	88.8	83.5	88.6	83.4	86.2	82.7	7927	90.5
1992	3108.4	445	80.3	83.3	80.2	83.2	79.5	82.5	7186	81.8
1993	3443.2	445	89.5	83.6	89.5	83.6	88.4	82.8	8052	92.0
1994	3497.6	445	90.8	84.1	90.7	84.0	89.7	83.2	8017	91.5
1995	3389.1	445	88.5	84.3	87.7	84.2	86.9	83.4	7834	89.4
1996	3203.5	445	82.5	84.2	82.0	84.1	82.0	83.3	7281	82.9
1997	3794.8	445	93.9	84.7	93.0	84.5	97.3	84.0	8309	94.9
1998	3852.4	488	93.4	85.1	91.3	84.9	90.1	84.3	8234	94.0

1999	3883.3	488	92.4	85.5	91.6	85.2	90.8	84.6	8304	94.8
2000	3618.0	488	86.5	85.5	84.9	85.2	84.4	84.6	7720	87.9
2001	3921.0	488	93.4	85.9	92.4	85.5	91.7	84.9	8233	94.0
2002	3790.1	488	91.4	86.1	89.3	85.7	88.7	85.1	8095	92.4
2003	3939.0	488	93.2	86.4	92.4	85.9	92.1	85.4	8194	93.5
2004	3715.0	488	86.9	86.4	86.5	86.0	86.7	85.4	7647	87.0
2005	4062.4	488	95.0	86.7	94.6	86.3	95.0	85.8	8351	95.3
2006	3964.8	488	92.6	86.9	92.1	86.5	92.7	86.0	8138	92.9
2007	4028.1	488	94.0	87.2	93.5	86.7	94.2	86.3	8285	94.6
2008	3671.8	488	84.9	87.1	84.5	86.7	85.7	86.3	7571	86.2
2009	4084.9	488	94.8	87.4	94.8	86.9	95.6	86.6	8345	95.3
2010	3955.6	488	92.3	87.5	91.9	87.1	92.5	86.8	8123	92.7
2011	4026.9	488	94.3	87.7	93.8	87.3	94.2	87.0	8295	94.7
2012	3653.0	496	84.9	87.6	84.1	87.2	83.9	86.9	7473	85.1
2013	4000.2	496	93.0	87.8	92.0	87.3	92.1	87.1	8219	93.8
2014	4010.6	496	93.4	88.0	92.6	87.5	92.3	87.2	8262	94.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					192	
C. Inspection, maintenance or repair combined with refuelling	498			696	7	
D. Inspection, maintenance or repair without refuelling				17		
E. Testing of plant systems or components				2		
L. Human factor related					1	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						4
Z. Other					8	
Subtotal	498	0	0	715	208	4
Total	498			927		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		13
14. Safety Systems		3
15. Reactor Cooling Systems		146
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		7
42. Electrical Power Supply Systems		1
Total	0	189

## FI-2 LOVIISA-2

**Operator:** FORTUMPH (FORTUM POWER AND HEAT OY (former IVO))

**Contractor:** AEE (ATOMENERGOEXPORT)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 496.0 MW(e)  
**Design Net Capacity:** 420.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 3872.8 GW(e)·h  
**Energy Availability Factor:** 88.9%  
**Load Factor:** 89.1%  
**Operating Factor:** 90.3%  
**Energy Unavailability Factor:** 11.1%  
**Total Off-line Time:** 848 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	369.7	335.0	371.1	357.7	368.4	354.0	352.3	161.1	106.2	366.2	358.9	372.0	3872.8
<b>EAF (%)</b>	99.7	100.0	100.0	99.8	99.8	99.2	96.6	44.8	28.9	98.4	99.9	99.9	88.9
<b>UCF (%)</b>	99.7	100.0	100.0	99.8	100.0	99.8	99.4	50.1	29.4	98.8	99.9	99.9	89.7
<b>LF (%)</b>	100.2	100.5	100.7	100.2	99.8	99.1	95.5	43.7	29.7	99.1	100.5	100.8	89.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	50.1	33.8	100.0	100.0	100.0	90.3
<b>EUAF (%)</b>	0.3	0.0	0.0	0.2	0.2	0.8	3.4	55.2	71.1	1.6	0.1	0.1	11.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.9	65.6	0.0	0.0	0.0	9.6
<b>UCLF (%)</b>	0.3	0.0	0.0	0.2	0.0	0.2	0.6	0.0	5.0	1.2	0.1	0.1	0.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.2	0.7	2.8	5.3	0.4	0.4	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE PLANT UNIT OPERATED AT FULL POWER IN BASE LOAD MODE AND UNDERWENT A WIDER INSPECTION OUTAGE, PERFORMED EVERY 4 YEARS.

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1972 **Lifetime Generation:** 124152.0 GW(e)·h  
**Date of First Criticality:** 17 Oct 1980 **Cumulative Energy Availability Factor:** 89.1%  
**Date of Grid Connection:** 04 Nov 1980 **Cumulative Load Factor:** 89.0%  
**Date of Commercial Operation:** 05 Jan 1981 **Cumulative Unit Capability Factor:** 89.9%  
**Cumulative Energy Unavailability Factor:** 10.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	2714.2	440	72.2	72.2	72.2	72.2	70.4	70.4	7062	80.6
1982	2997.4	440	78.0	75.1	78.0	75.1	77.8	74.1	7046	80.4
1983	3474.5	445	90.1	80.1	90.1	80.1	89.1	79.1	8063	92.0
1984	3608.6	445	92.6	83.3	92.6	83.3	92.3	82.5	8251	93.9
1985	3549.8	440	92.2	85.0	92.2	85.0	92.1	84.4	8162	93.2
1986	3174.9	445	81.5	84.4	81.5	84.4	81.4	83.9	7273	83.0
1987	3572.1	445	93.4	85.7	93.4	85.7	91.6	85.0	8242	94.1
1988	3602.3	445	94.7	86.8	94.7	86.8	92.2	85.9	8305	94.5
1989	3551.0	445	91.8	87.4	91.7	87.4	91.1	86.5	8128	92.8
1990	3251.1	445	85.3	87.2	85.3	87.2	83.4	86.2	7584	86.6
1991	3442.2	445	89.9	87.4	89.0	87.3	88.3	86.4	7941	90.7
1992	3468.4	445	89.5	87.6	89.1	87.5	88.7	86.6	7931	90.3
1993	3550.8	445	91.3	87.9	91.2	87.8	91.2	86.9	8050	92.0
1994	3124.7	445	81.2	87.4	80.5	87.3	80.2	86.4	7170	81.8
1995	3060.3	445	78.4	86.8	77.6	86.6	78.5	85.9	7064	80.6
1996	3621.3	445	93.1	87.2	92.7	87.0	92.6	86.3	8227	93.7
1997	3804.7	445	92.9	87.5	92.0	87.3	97.6	87.0	8267	94.4
1998	3687.9	488	88.6	87.6	86.4	87.2	86.3	86.9	7892	90.1
1999	3974.3	488	94.2	88.0	93.5	87.6	93.0	87.3	8281	94.5
2000	3885.1	488	94.1	88.3	90.9	87.8	90.6	87.5	8314	94.6
2001	3781.1	488	92.3	88.5	89.6	87.9	88.4	87.5	8149	93.0
2002	3498.7	488	84.5	88.3	82.6	87.6	81.8	87.2	7463	85.2



2003	3736.7	488	90.1	88.4	90.0	87.7	87.4	87.3	8358	95.4
2004	4009.2	488	93.6	88.6	93.1	88.0	93.5	87.5	8231	93.7
2005	4076.1	488	95.4	88.9	94.5	88.2	95.4	87.9	8376	95.6
2006	3766.6	488	88.5	88.9	87.5	88.2	88.1	87.9	7863	89.8
2007	4090.9	488	95.5	89.2	94.9	88.5	95.7	88.2	8403	95.9
2008	3998.0	488	93.5	89.3	92.5	88.6	93.3	88.4	8240	93.8
2009	4063.8	488	94.6	89.5	94.3	88.8	95.1	88.6	8318	95.0
2010	3789.1	488	88.8	89.5	88.1	88.8	88.6	88.6	7797	89.0
2011	4035.3	488	94.5	89.7	93.7	89.0	94.4	88.8	8290	94.6
2012	3959.2	496	92.0	89.7	91.0	89.0	90.9	88.9	8141	92.7
2013	4040.0	496	93.7	89.9	92.4	89.1	93.0	89.0	8250	94.2
2014	3872.8	496	89.7	89.9	88.9	89.1	89.1	89.0	7912	90.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		33			88	
C. Inspection, maintenance or repair combined with refuelling	815			643	1	
D. Inspection, maintenance or repair without refuelling				35		
Z. Other				1	2	
Subtotal	815	33	0	679	91	0
Total		848			770	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		8
14. Safety Systems		4
15. Reactor Cooling Systems		42
16. Steam generation systems		1
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System	33	14
41. Main Generator Systems		1
XX. Miscellaneous Systems		2
Total	33	83

# FI-3 OLKILUOTO-1

**Operator:** TVO (TEOLLISUUDEN VOIMA OYJ)  
**Contractor:** ASEASTAL (ASEA-ATOM / STAL-LAVAL)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP at the beginning of 2014):** 880.0 MW(e)  
**Design Net Capacity:** 660.0 MW(e)  
**Design Discharge Burnup:** 47000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 7266.1 GW(e)·h  
**Energy Availability Factor:** 94.0%  
**Load Factor:** 94.3%  
**Operating Factor:** 95.2%  
**Energy Unavailability Factor:** 6.0%  
**Total Off-line Time:** 423 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	659.8	595.6	647.4	627.4	273.5	626.0	638.4	628.3	625.6	655.5	637.7	650.9	7266.1
<b>EAF (%)</b>	100.0	99.9	98.3	98.8	42.5	98.9	97.6	96.1	98.8	99.9	100.0	98.6	94.0
<b>UCF (%)</b>	100.0	99.9	98.3	98.8	43.5	100.0	100.0	99.9	100.0	99.9	100.0	98.6	94.8
<b>LF (%)</b>	100.8	100.7	99.0	99.0	41.8	98.8	97.5	96.0	98.7	100.0	100.7	99.4	94.3
<b>OF (%)</b>	100.0	100.0	98.9	100.0	44.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.2
<b>EUf (%)</b>	0.0	0.1	1.7	1.2	57.5	1.1	2.4	3.9	1.2	0.1	0.0	1.4	6.0
<b>PUf (%)</b>	0.0	0.1	0.0	0.0	50.2	0.0	0.0	0.1	0.0	0.1	0.0	0.2	4.3
<b>UCLF (%)</b>	0.0	0.0	1.7	1.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.0	1.1	2.4	3.8	1.2	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE ELECTRICITY PRODUCTION OF THE OLKILUOTO POWER PLANT UNITS, OL1 AND OL2, DURING 2014 WAS 14,763 GWH. THE TOTAL LOAD FACTOR WAS 96.0 PER CENT. THE PLANT UNITS OPERATED SAFELY. OL1'S NET PRODUCTION WAS 7,266 GWH AND THE LOAD FACTOR 94.5 PER CENT. OL2'S NET PRODUCTION WAS 7,497 GWH AND THE LOAD FACTOR 97.4 PER CENT. THE ANNUAL OUTAGES OF 2014 AT THE OLKILUOTO NUCLEAR POWER PLANT WERE CARRIED OUT IN MAY 11–JUNE 9, 2014. OL1 UNDERWENT A MAINTENANCE OUTAGE THAT LASTED MORE THAN 17 DAYS, AND OL2 HAD A REFUELING OUTAGE TAKING LESS THAN 8 DAYS. THE MAIN MAINTENANCE ACTIVITIES DURING THE OUTAGE AT OL1 INCLUDED THE REPLACEMENT OF LOW-VOLTAGE SWITCHGEARS IN TWO SUBSYSTEMS, PIPING MODIFICATIONS IN THE AUXILIARY FEEDWATER SYSTEM, INSTALLATION OF A NEW AUXILIARY TRANSFORMER, AND SEVERAL OTHER MODIFICATION AND MAINTENANCE TASKS.

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1974 **Lifetime Generation:** 223888.2 GW(e)·h  
**Date of First Criticality:** 21 Jul 1978 **Cumulative Energy Availability Factor:** 92.7%  
**Date of Grid Connection:** 02 Sep 1978 **Cumulative Load Factor:** 92.5%  
**Date of Commercial Operation:** 10 Oct 1979 **Cumulative Unit Capability Factor:** 93.1%  
**Cumulative Energy Unavailability Factor:** 7.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979	1265.2	660	86.9	86.9	86.9	86.9	86.8	86.8	1996	90.4
1980	4280.8	658	76.3	78.4	76.3	78.4	74.1	76.6	6849	78.0
1981	4549.2	660	80.8	79.5	80.8	79.5	78.7	77.5	7353	83.9
1982	4997.5	658	86.7	81.7	86.7	81.7	86.7	80.4	7903	90.2
1983	4808.3	669	81.9	81.7	81.9	81.7	82.0	80.7	7651	87.3
1984	5505.6	694	91.9	83.8	91.9	83.8	90.3	82.6	8247	93.9
1985	5414.5	710	88.8	84.6	88.8	84.6	87.1	83.4	8180	93.4
1986	5463.2	710	90.1	85.4	90.1	85.4	87.8	84.0	8008	91.4
1987	5636.5	710	92.1	86.2	92.1	86.2	90.6	84.9	8142	92.9
1988	5778.9	710	94.3	87.1	94.1	87.1	92.7	85.7	8248	93.9
1989	5056.2	710	83.2	86.7	83.2	86.7	81.3	85.3	7278	83.1
1990	5857.3	710	95.6	87.5	95.6	87.5	94.2	86.1	8356	95.4
1991	5873.2	710	95.7	88.2	94.9	88.1	94.4	86.8	8373	95.6
1992	5803.0	710	93.7	88.7	93.2	88.5	93.0	87.3	8251	93.9

1993	5944.9	710	95.8	89.2	95.3	89.0	95.6	87.9	8433	96.3
1994	5978.0	710	96.5	89.7	96.0	89.5	96.1	88.4	8485	96.9
1995	5931.5	710	96.1	90.1	95.5	89.9	95.4	88.9	8427	96.2
1996	5938.6	710	92.2	90.2	92.1	90.0	95.2	89.2	8212	93.5
1997	6374.2	772	93.9	90.4	93.8	90.2	94.2	89.5	8254	94.2
1998	6807.0	840	95.6	90.7	95.0	90.5	92.5	89.7	8384	95.7
1999	7111.8	840	97.2	91.1	96.4	90.9	96.6	90.1	8542	97.5
2000	7043.1	840	95.8	91.4	95.2	91.1	95.5	90.4	8448	96.2
2001	7163.8	840	97.6	91.7	97.2	91.4	97.4	90.8	8561	97.7
2002	6997.5	840	95.5	91.9	95.1	91.6	95.1	91.0	8377	95.6
2003	7127.4	840	97.1	92.1	96.5	91.8	96.9	91.3	8515	97.2
2004	7009.0	840	94.7	92.2	94.7	91.9	95.0	91.4	8329	94.8
2005	7221.1	840	97.8	92.5	97.7	92.2	98.1	91.7	8588	98.0
2006	6973.4	840	93.3	92.5	92.6	92.2	93.6	91.8	8206	93.7
2007	7334.9	860	97.4	92.7	96.7	92.4	97.4	92.0	8554	97.6
2008	7066.0	860	93.6	92.7	93.1	92.4	93.5	92.1	8288	94.4
2009	7295.8	860	97.2	92.9	96.7	92.6	96.8	92.3	8548	97.6
2010	6976.9	880	92.0	92.9	91.4	92.5	91.5	92.2	8120	92.7
2011	7289.8	880	95.6	93.0	94.8	92.6	94.6	92.3	8410	96.0
2012	6973.4	880	90.9	92.9	90.1	92.5	90.2	92.2	8013	91.2
2013	7470.4	880	97.4	93.1	96.4	92.7	96.9	92.4	8555	97.7
2014	7266.1	880	94.8	93.1	94.0	92.7	94.3	92.5	8337	95.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1979 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		55			89	
C. Inspection, maintenance or repair combined with refuelling	368			422		
D. Inspection, maintenance or repair without refuelling				15		
E. Testing of plant systems or components					5	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						12
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Z. Other					29	
Subtotal	368	55	0	437	124	12
Total		423			573	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1979 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	47	6
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		0
14. Safety Systems		4
15. Reactor Cooling Systems	8	11
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		2
33. Circulating Water System		2
41. Main Generator Systems		38
42. Electrical Power Supply Systems		1
Total	55	83

## FI-4 OLKILUOTO-2

**Operator:** TVO (TEOLLISUUDEN VOIMA OYJ)  
**Contractor:** ASEASTAL (ASEA-ATOM / STAL-LAVAL)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 880.0 MW(e)  
**Design Net Capacity:** 660.0 MW(e)  
**Design Discharge Burnup:** 45500 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7496.5 GW(e)·h  
**Energy Availability Factor:** 96.7%  
**Load Factor:** 97.2%  
**Operating Factor:** 97.8%  
**Energy Unavailability Factor:** 3.3%  
**Total Off-line Time:** 193 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	662.0	598.9	661.3	638.3	646.6	454.4	623.8	628.4	625.4	657.7	638.7	661.0	7496.5
<b>EAF (%)</b>	99.8	100.0	99.9	100.0	99.2	71.8	95.4	96.1	98.8	100.0	99.9	99.8	96.7
<b>UCF (%)</b>	99.8	100.0	99.9	100.0	100.0	73.2	98.4	100.0	99.9	100.0	99.9	99.8	97.6
<b>LF (%)</b>	101.1	101.3	101.1	100.7	98.8	71.7	95.3	96.0	98.7	100.3	100.8	101.0	97.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	74.0	99.2	100.0	100.0	100.0	100.0	100.0	97.8
<b>EUf (%)</b>	0.2	0.0	0.1	0.0	0.8	28.2	4.6	3.9	1.2	0.0	0.1	0.2	3.3
<b>PUf (%)</b>	0.2	0.0	0.1	0.0	0.0	26.1	0.0	0.0	0.1	0.0	0.1	0.2	2.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.7	1.6	0.0	0.0	0.0	0.0	0.0	0.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.8	1.4	3.1	3.9	1.1	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE ELECTRICITY PRODUCTION OF THE OLKILUOTO POWER PLANT UNITS, OL1 AND OL2, DURING 2014 WAS 14,763 GWH. THE TOTAL LOAD FACTOR WAS 96.0 PER CENT. THE PLANT UNITS OPERATED SAFELY. OL1'S NET PRODUCTION WAS 7,266 GWH AND THE LOAD FACTOR 94.5 PER CENT. OL2'S NET PRODUCTION WAS 7,497 GWH AND THE LOAD FACTOR 97.4 PER CENT. THE ANNUAL OUTAGES OF 2014 AT THE OLKILUOTO NUCLEAR POWER PLANT WERE CARRIED OUT IN MAY 11–JUNE 9, 2014. OL1 UNDERWENT A MAINTENANCE OUTAGE THAT LASTED MORE THAN 17 DAYS, AND OL2 HAD A REFUELING OUTAGE TAKING LESS THAN 8 DAYS. OL2 HAD A REFUELING OUTAGE OF ABOUT ONE WEEK. IN ADDITION TO REFUELING, MAINTENANCE AND REPAIR WORK AS WELL AS TESTS WERE CARRIED OUT, AND TWO MAIN SEAWATER PUMPS WERE REPLACED.

### 5. Historical Summary

**Date of Construction Start:** 01 Nov 1975      **Lifetime Generation:** 215283.6 GW(e)·h  
**Date of First Criticality:** 13 Oct 1979      **Cumulative Energy Availability Factor:** 93.7%  
**Date of Grid Connection:** 18 Feb 1980      **Cumulative Load Factor:** 93.5%  
**Date of Commercial Operation:** 10 Jul 1982      **Cumulative Unit Capability Factor:** 94.2%  
**Cumulative Energy Unavailability Factor:** 6.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1982	2256.6	658	77.7	77.7	77.7	77.7	77.6	77.6	3513	79.5
1983	5087.2	657	86.7	83.7	86.7	83.7	88.4	84.8	8221	93.8
1984	5341.3	696	89.6	86.1	89.6	86.1	87.3	85.8	8031	91.4
1985	5415.8	710	88.2	86.7	88.2	86.7	87.1	86.2	7912	90.3
1986	5840.2	710	95.1	88.6	95.1	88.6	93.9	88.0	8437	96.3
1987	5725.0	710	93.7	89.6	93.7	89.6	92.0	88.7	8379	95.7
1988	5713.2	710	92.7	90.1	92.7	90.1	91.6	89.2	8220	93.6
1989	5827.0	710	94.9	90.7	94.9	90.7	93.7	89.8	8363	95.5
1990	5749.9	710	93.8	91.1	93.8	91.1	92.4	90.1	8265	94.3
1991	5731.0	710	93.7	91.4	93.0	91.3	92.1	90.3	8216	93.8
1992	5790.4	710	94.5	91.7	93.3	91.5	92.8	90.6	8306	94.6
1993	5861.6	710	95.1	92.0	94.4	91.7	94.2	90.9	8327	95.1
1994	5732.6	710	93.2	92.1	92.3	91.8	92.2	91.0	8130	92.8
1995	5747.2	710	93.7	92.2	92.5	91.8	92.4	91.1	8236	94.0
1996	5915.4	710	95.3	92.4	95.0	92.1	94.8	91.4	8413	95.8
1997	6077.0	736	94.6	92.6	93.7	92.2	94.1	91.5	8258	94.3

1998	6628.5	840	94.3	92.7	93.2	92.2	90.1	91.4	8207	93.7
1999	7091.2	840	96.9	93.0	96.4	92.5	96.4	91.8	8505	97.1
2000	7028.9	840	95.9	93.1	95.3	92.7	95.3	92.0	8457	96.3
2001	6988.0	840	95.1	93.3	95.1	92.8	95.0	92.2	8387	95.7
2002	7108.5	840	97.0	93.5	96.8	93.1	96.6	92.4	8472	96.7
2003	7026.9	840	95.5	93.6	95.2	93.2	95.5	92.6	8378	95.6
2004	7080.7	840	95.8	93.7	95.8	93.3	96.0	92.7	8485	96.6
2005	6996.7	840	93.8	93.7	93.8	93.3	94.0	92.8	8248	94.2
2006	7294.4	860	97.4	93.9	96.4	93.5	96.8	93.0	8562	97.7
2007	7051.3	860	94.0	93.9	93.2	93.5	93.6	93.0	8258	94.3
2008	7313.8	860	96.9	94.0	96.3	93.6	96.8	93.2	8579	97.7
2009	7156.3	860	95.2	94.0	94.5	93.6	95.0	93.2	8365	95.5
2010	7167.3	860	95.3	94.1	94.6	93.7	95.1	93.3	8386	95.7
2011	6913.5	880	90.7	94.0	89.9	93.5	90.7	93.2	7987	91.2
2012	7477.2	880	97.3	94.1	95.8	93.6	96.7	93.4	8561	97.5
2013	7162.8	880	93.1	94.1	92.0	93.5	92.9	93.3	8171	93.3
2014	7496.5	880	97.6	94.2	96.7	93.7	97.2	93.5	8567	97.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		6			289	
C. Inspection, maintenance or repair combined with refuelling	183	4		374		
D. Inspection, maintenance or repair without refuelling				15		
E. Testing of plant systems or components				20	0	
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						12
L. Human factor related					8	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
P. Fire					0	
Z. Other					1	0
Subtotal	183	10	0	409	298	14
Total		193			721	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		0
13. Reactor Auxiliary Systems		0
14. Safety Systems		2
15. Reactor Cooling Systems		15
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		5
32. Feedwater and Main Steam System		6
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems	6	242
42. Electrical Power Supply Systems		3
XX. Miscellaneous Systems		0
Total	6	283

# FR-54 BELLEVILLE-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1310.0 MW(e)  
 Design Net Capacity: 1310.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 7723.7 GW(e)·h  
 Energy Availability Factor: 70.7%  
 Load Factor: 67.3%  
 Operating Factor: 73.0%  
 Energy Unavailability Factor: 29.3%  
 Total Off-line Time: 2369 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	908.5	784.4	874.7	859.4	868.8	904.6	539.6	0.0	0.0	260.7	762.1	961.1	7723.7
EAF (%)	99.6	95.5	99.0	99.8	94.1	97.8	56.1	0.0	0.0	26.8	81.9	99.9	70.7
UCF (%)	99.6	95.5	99.0	99.8	94.1	98.9	57.2	0.0	0.0	27.3	85.6	99.9	71.2
LF (%)	93.2	89.1	89.9	91.1	89.1	95.9	55.4	0.0	0.0	26.7	80.8	98.6	67.3
OF (%)	100.0	97.9	100.0	100.0	100.0	100.0	58.2	0.0	0.0	38.7	82.9	100.0	73.0
EUf (%)	0.4	4.5	1.0	0.2	5.9	2.2	43.9	100.0	100.0	73.2	18.1	0.1	29.3
PUf (%)	0.2	0.1	0.0	0.0	0.0	0.0	42.1	100.0	96.9	11.1	0.0	0.0	21.0
UCLF (%)	0.2	4.4	1.0	0.1	5.9	1.2	0.8	0.0	3.1	61.7	14.4	0.1	7.8
XUF (%)	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.5	3.7	0.0	0.5

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 May 1980      Lifetime Generation: 218283.9 GW(e)·h  
 Date of First Criticality: 09 Sep 1987      Cumulative Energy Availability Factor: 75.9%  
 Date of Grid Connection: 14 Oct 1987      Cumulative Load Factor: 70.5%  
 Date of Commercial Operation: 01 Jun 1988      Cumulative Unit Capability Factor: 77.2%  
    Cumulative Energy Unavailability Factor: 24.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	4334.0	1310	86.1	86.1	85.8	85.8	64.4	64.4	4421	86.1
1989	5152.6	1310	46.5	61.1	46.0	60.7	44.9	52.1	4244	48.4
1990	7914.3	1310	71.4	65.1	71.2	64.7	69.0	58.6	6408	73.2
1991	8660.2	1310	80.8	69.5	79.3	68.8	75.5	63.3	7092	81.0
1992	8494.3	1310	91.8	74.4	91.2	73.7	73.8	65.6	7600	86.5
1993	7921.5	1310	77.5	74.9	71.3	73.2	69.0	66.2	6873	78.5
1994	6575.8	1310	65.2	73.4	64.0	71.8	57.3	64.9	5848	66.8
1995	7740.9	1310	76.2	73.8	73.4	72.1	67.5	65.2	6796	77.6
1996	7365.1	1310	76.8	74.2	76.5	72.6	64.0	65.1	6002	68.3
1997	9785.3	1310	93.4	76.2	93.2	74.7	85.3	67.2	8294	94.7
1998	5740.9	1310	53.7	74.0	51.2	72.5	50.0	65.6	4865	55.5
1999	9580.5	1310	92.0	75.6	90.4	74.0	83.5	67.1	7957	90.8
2000	4238.6	1310	38.0	72.6	37.9	71.2	36.8	64.7	3459	39.4
2001	9564.5	1310	87.3	73.7	86.8	72.3	83.3	66.1	7774	88.7
2002	9567.3	1310	99.6	75.5	98.9	74.1	83.4	67.3	8447	96.4
2003	8401.7	1310	77.6	75.6	75.4	74.2	73.2	67.6	6871	78.4
2004	9291.0	1310	88.6	76.4	88.0	75.1	80.7	68.4	7645	87.0
2005	10236.4	1310	98.8	77.7	97.1	76.3	89.2	69.6	8646	98.7
2006	7926.7	1310	77.1	77.6	74.8	76.2	69.1	69.6	6870	78.4
2007	8512.1	1310	77.5	77.6	75.8	76.2	74.2	69.8	7213	82.3
2008	6305.0	1310	55.3	76.5	55.2	75.2	54.8	69.1	5615	63.9
2009	10402.3	1310	93.0	77.3	92.1	76.0	90.6	70.1	8350	95.3
2010	6650.3	1310	59.2	76.5	58.2	75.2	58.0	69.5	5370	61.3

2011	7876.3	1310	73.0	76.3	71.8	75.0	68.6	69.5	6525	74.5
2012	10483.6	1310	98.1	77.2	97.0	75.9	91.1	70.4	8691	98.9
2013	8658.6	1310	82.0	77.4	80.2	76.1	75.5	70.6	7309	83.4
2014	7723.7	1310	71.2	77.2	70.7	75.9	67.3	70.5	6391	73.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		590			499	
B. Refuelling without a maintenance				29		
C. Inspection, maintenance or repair combined with refuelling	1753			1018	7	
D. Inspection, maintenance or repair without refuelling				6		
E. Testing of plant systems or components				45	2	0
H. Nuclear regulatory requirements					83	
L. Human factor related					18	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			23		2	47
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						0
Z. Other					20	
Subtotal	1753	590	23	1098	631	48
Total		2366			1777	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		25
12. Reactor I&C Systems		60
13. Reactor Auxiliary Systems		49
14. Safety Systems		31
15. Reactor Cooling Systems		34
16. Steam generation systems		49
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		8
31. Turbine and auxiliaries	388	53
32. Feedwater and Main Steam System		72
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems		38
42. Electrical Power Supply Systems		18
XX. Miscellaneous Systems	202	57
Total	590	494

## FR-55 BELLEVILLE-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1310.0 MW(e)

Design Net Capacity: 1310.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 10177.7 GW(e)·h

Energy Availability Factor: 98.9%

Load Factor: 88.7%

Operating Factor: 99.9%

Energy Unavailability Factor: 1.1%

Total Off-line Time: 7 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	832.9	750.0	826.7	826.3	888.1	835.8	779.9	750.6	882.8	923.8	918.4	962.5	10177.7
EAF (%)	99.9	99.7	98.9	99.9	99.6	98.9	99.5	99.5	97.4	95.9	98.6	99.1	98.9
UCF (%)	100.0	99.7	98.9	99.9	99.6	99.4	99.8	99.7	98.8	98.1	99.7	99.8	99.4
LF (%)	85.5	85.2	84.9	87.6	91.1	88.6	80.0	77.0	93.6	94.7	97.4	98.8	88.7
OF (%)	100.0	100.0	99.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9
EUf (%)	0.1	0.3	1.1	0.1	0.4	1.1	0.5	0.5	2.6	4.1	1.4	0.9	1.1
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
UCLF (%)	0.0	0.3	1.1	0.1	0.4	0.6	0.2	0.3	1.2	1.8	0.2	0.2	0.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.5	0.3	0.2	1.4	2.2	1.2	0.7	0.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

BASE LOAD

### 5. Historical Summary

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 218578.2 GW(e)·h

Date of First Criticality: 25 May 1988      Cumulative Energy Availability Factor: 78.4%

Date of Grid Connection: 06 Jul 1988      Cumulative Load Factor: 72.6%

Date of Commercial Operation: 01 Jan 1989      Cumulative Unit Capability Factor: 80.3%

Cumulative Energy Unavailability Factor: 21.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	8505.7	1310	87.0	87.0	86.6	86.6	74.1	74.1	7419	84.7
1990	6324.0	1310	58.4	72.7	56.9	71.8	55.1	64.6	5350	61.1
1991	7876.3	1310	73.3	72.9	70.3	71.3	68.6	66.0	6578	75.1
1992	8262.1	1310	75.9	73.7	75.3	72.3	71.8	67.4	6904	78.6
1993	8871.3	1310	83.4	75.6	80.1	73.8	77.3	69.4	7435	84.9
1994	8241.3	1310	80.4	76.4	76.9	74.4	71.8	69.8	7122	81.3
1995	7960.5	1310	99.3	79.7	97.5	77.7	69.4	69.7	7438	84.9
1996	7229.8	1310	74.5	79.0	71.2	76.8	62.8	68.9	6666	75.9
1997	8508.1	1310	84.9	79.7	82.0	77.4	74.1	69.5	7339	83.8
1998	5068.0	1310	45.0	76.2	45.0	74.2	44.2	66.9	4239	48.4
1999	4899.3	1310	44.8	73.3	43.3	71.4	42.7	64.7	4040	46.1
2000	9882.5	1310	97.4	75.4	96.7	73.5	85.9	66.5	8271	94.2
2001	8458.0	1310	79.2	75.7	78.6	73.9	73.7	67.0	6935	79.2
2002	9378.7	1310	86.1	76.4	84.3	74.6	81.7	68.1	7687	87.8
2003	8624.7	1310	80.4	76.7	79.4	74.9	75.2	68.6	7135	81.4
2004	10202.6	1310	98.0	78.0	97.1	76.3	88.7	69.8	8621	98.1
2005	9242.3	1310	86.9	78.5	84.4	76.8	80.5	70.5	7767	88.7
2006	8743.6	1310	81.7	78.7	79.1	76.9	76.2	70.8	7309	83.4
2007	9516.0	1310	89.4	79.3	88.6	77.5	82.9	71.4	7895	90.1
2008	9734.9	1310	92.6	79.9	92.4	78.3	84.6	72.1	8327	94.8
2009	6310.9	1310	62.7	79.1	55.6	77.2	55.0	71.3	5166	59.0
2010	7869.7	1310	73.5	78.9	70.0	76.9	68.6	71.1	6361	72.6
2011	10390.9	1310	98.4	79.7	96.1	77.7	90.5	72.0	8727	99.6



2012	8959.3	1310	84.8	79.9	81.9	77.9	77.9	72.2	7456	84.9
2013	7480.5	1310	71.1	79.6	69.4	77.6	65.2	71.9	6273	71.6
2014	10177.7	1310	99.4	80.3	98.9	78.4	88.7	72.6	8753	99.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		7			355	
C. Inspection, maintenance or repair combined with refuelling				983		
E. Testing of plant systems or components				38		
H. Nuclear regulatory requirements					114	
L. Human factor related					18	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					1	34
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						3
Z. Other					44	0
Subtotal	0	7	0	1021	532	37
Total		7			1590	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		35
12. Reactor I&C Systems		52
13. Reactor Auxiliary Systems		11
14. Safety Systems		26
15. Reactor Cooling Systems		39
16. Steam generation systems		31
17. Safety I&C Systems (excluding reactor I&C)		8
21. Fuel Handling and Storage Facilities		13
31. Turbine and auxiliaries	7	33
32. Feedwater and Main Steam System		10
33. Circulating Water System		2
35. All other I&C Systems		2
41. Main Generator Systems		4
42. Electrical Power Supply Systems		13
XX. Miscellaneous Systems		69
Total	7	348

# FR-32 BLAYAIS-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 910.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6245.0 GW(e)·h

Energy Availability Factor: 81.8%

Load Factor: 78.3%

Operating Factor: 82.4%

Energy Unavailability Factor: 18.2%

Total Off-line Time: 1546 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	674.3	609.0	155.2	0.0	430.6	638.5	609.0	613.4	609.3	628.1	626.8	650.8	6245.0
EAF (%)	99.9	100.0	22.7	0.0	70.4	98.1	99.4	99.5	97.8	97.3	100.0	97.2	81.8
UCF (%)	99.9	100.0	22.7	0.0	74.6	98.9	99.9	99.9	98.4	99.9	100.0	97.2	82.6
LF (%)	99.6	99.6	23.0	0.0	63.6	97.4	90.0	90.6	93.0	92.6	95.7	96.1	78.3
OF (%)	100.0	100.0	22.9	0.0	70.3	100.0	100.0	100.0	98.1	100.0	100.0	97.6	82.4
EUf (%)	0.1	0.0	77.3	100.0	29.6	1.9	0.6	0.5	2.2	2.7	0.0	2.8	18.2
PUF (%)	0.1	0.0	77.3	100.0	5.2	0.4	0.0	0.0	1.6	0.0	0.0	0.1	15.4
UCLF (%)	0.1	0.0	0.0	0.0	20.2	0.8	0.1	0.1	0.0	0.1	0.0	2.8	2.0
XUF (%)	0.0	0.0	0.0	0.0	4.2	0.7	0.5	0.5	0.6	2.6	0.0	0.0	0.8

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Jan 1977      Lifetime Generation: 191841.0 GW(e)·h

Date of First Criticality: 20 May 1981      Cumulative Energy Availability Factor: 76.6%

Date of Grid Connection: 12 Jun 1981      Cumulative Load Factor: 72.3%

Date of Commercial Operation: 01 Dec 1981      Cumulative Unit Capability Factor: 79.1%

Cumulative Energy Unavailability Factor: 23.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	449.0	915	65.6	65.6	65.6	65.6	65.6	65.6	522	70.2
1982	6129.8	910	81.5	80.2	81.5	80.2	76.9	76.0	7588	86.6
1983	3453.0	910	43.9	62.8	43.9	62.8	43.3	60.3	4285	48.9
1984	6509.0	910	84.6	69.9	84.6	69.9	81.4	67.2	7536	85.8
1985	6225.2	910	83.0	73.1	82.8	73.0	78.1	69.8	7348	83.9
1986	6460.6	910	87.8	76.0	87.0	75.8	81.0	72.1	7754	88.5
1987	5586.6	910	78.2	76.3	76.2	75.8	70.1	71.7	6793	77.5
1988	5730.0	910	82.1	77.1	81.3	76.6	71.7	71.7	7069	80.5
1989	6222.4	910	84.2	78.0	83.3	77.4	78.1	72.5	7419	84.7
1990	5822.6	910	77.2	77.9	76.9	77.4	73.0	72.6	6834	78.0
1991	6379.0	910	83.8	78.5	83.3	78.0	80.0	73.3	7400	84.5
1992	4349.2	910	57.5	76.6	56.6	76.0	54.4	71.6	5079	57.8
1993	5979.2	910	83.7	77.2	78.3	76.2	75.0	71.9	7253	82.8
1994	3474.9	910	86.6	77.9	85.8	77.0	43.6	69.7	5119	58.4
1995	6075.8	910	87.1	78.6	84.3	77.5	76.2	70.2	7206	82.3
1996	6639.1	910	88.5	79.2	85.6	78.0	83.1	71.0	7798	88.8
1997	6196.6	910	90.1	79.9	84.6	78.4	77.7	71.4	7621	87.0
1998	5917.6	910	81.1	80.0	78.2	78.4	74.2	71.6	7078	80.8
1999	6046.8	910	80.9	80.0	77.9	78.4	75.9	71.8	7082	80.8
2000	2854.1	910	53.4	78.6	36.6	76.2	35.7	69.9	3602	41.0
2001	4881.5	910	66.2	78.0	64.0	75.6	61.2	69.5	5768	65.8
2002	6861.1	910	95.0	78.8	93.0	76.4	86.1	70.3	8251	94.2
2003	4541.7	910	61.8	78.0	58.1	75.6	57.0	69.7	5321	60.7

2004	6144.3	910	81.5	78.2	79.2	75.7	76.9	70.0	7217	82.2
2005	6883.6	910	87.7	78.6	86.8	76.2	86.3	70.7	7841	89.5
2006	6508.0	910	84.0	78.8	81.6	76.4	81.6	71.1	7440	84.9
2007	6891.0	910	88.3	79.2	86.4	76.8	86.4	71.7	7791	88.9
2008	6678.7	910	86.1	79.4	83.7	77.0	83.6	72.1	7651	87.1
2009	4604.6	910	71.4	79.1	58.4	76.4	57.8	71.6	5461	62.3
2010	6634.7	910	87.0	79.4	86.1	76.7	83.2	72.0	7679	87.7
2011	6465.2	910	83.5	79.5	82.7	76.9	81.1	72.3	7370	84.1
2012	4170.6	910	53.0	78.7	52.2	76.1	52.2	71.7	4690	53.4
2013	6809.7	910	86.9	79.0	85.9	76.4	85.4	72.1	7659	87.4
2014	6245.0	910	82.6	79.1	81.8	76.6	78.3	72.3	7214	82.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		157			418	0
B. Refuelling without a maintenance				133		
C. Inspection, maintenance or repair combined with refuelling	1295			903	5	
D. Inspection, maintenance or repair without refuelling				35		
E. Testing of plant systems or components	8			1	1	
H. Nuclear regulatory requirements					62	
J. Grid limitation, failure or grid unavailability			53			
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			5			
L. Human factor related					11	1
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						51
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			31		19	25
Z. Other					18	
Subtotal	1303	157	89	1072	534	77
Total		1549			1683	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		26
12. Reactor I&C Systems		65
13. Reactor Auxiliary Systems		6
14. Safety Systems	10	26
15. Reactor Cooling Systems		64
16. Steam generation systems		10
17. Safety I&C Systems (excluding reactor I&C)		4
21. Fuel Handling and Storage Facilities		43
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System	36	28
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems		75
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems	111	24
Total	157	410

## FR-33 BLAYAIS-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 910.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6064.4 GW(e)·h

Energy Availability Factor: 87.1%

Load Factor: 76.1%

Operating Factor: 80.3%

Energy Unavailability Factor: 12.9%

Total Off-line Time: 1730 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	313.6	661.1	642.6	652.8	541.9	464.8	229.5	635.4	578.5	655.5	688.7	6064.4
EAF (%)	0.0	50.3	95.4	100.0	99.9	99.1	99.5	100.0	99.9	99.8	99.9	99.8	87.1
UCF (%)	16.3	50.3	95.4	100.0	99.9	99.1	99.5	100.0	99.9	99.9	99.9	100.0	88.5
LF (%)	0.0	51.3	97.8	98.1	96.4	82.7	68.7	33.9	97.0	85.3	100.0	101.7	76.1
OF (%)	0.0	63.1	99.1	100.0	100.0	87.6	81.9	42.2	100.0	89.7	100.0	100.0	80.3
EUf (%)	100.0	49.7	4.6	0.0	0.1	0.9	0.5	0.0	0.1	0.2	0.1	0.2	12.9
PUF (%)	74.0	7.9	4.6	0.0	0.0	0.6	0.0	0.0	0.1	0.0	0.0	0.0	7.3
UCLF (%)	9.7	41.8	0.0	0.0	0.1	0.3	0.5	0.1	0.0	0.0	0.0	0.0	4.1
XUF (%)	16.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	1.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Jan 1977      Lifetime Generation: 196414.9 GW(e)·h

Date of First Criticality: 28 Jun 1982      Cumulative Energy Availability Factor: 79.9%

Date of Grid Connection: 17 Jul 1982      Cumulative Load Factor: 76.3%

Date of Commercial Operation: 01 Feb 1983      Cumulative Unit Capability Factor: 82.1%

Cumulative Energy Unavailability Factor: 20.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	4490.0	910	62.3	62.3	62.3	62.3	61.6	61.6	5120	63.9
1984	6645.0	910	85.5	74.5	85.5	74.5	83.1	72.8	7716	87.8
1985	6819.7	910	90.0	79.8	89.9	79.8	85.5	77.2	7937	90.6
1986	6048.4	910	83.2	80.7	82.9	80.5	75.9	76.9	7142	81.5
1987	5987.1	910	84.8	81.5	84.2	81.3	75.1	76.5	7218	82.4
1988	4162.0	910	91.2	83.1	90.8	82.9	52.1	72.4	5718	65.1
1989	5561.0	910	77.0	82.3	73.4	81.5	69.8	72.0	6720	76.7
1990	5656.4	910	87.4	82.9	85.7	82.1	71.0	71.9	7381	84.3
1991	5326.5	910	78.3	82.4	75.1	81.3	66.8	71.3	6789	77.5
1992	5953.3	910	86.9	82.8	83.7	81.5	74.5	71.6	7505	85.4
1993	5253.2	910	71.0	81.8	67.0	80.2	65.9	71.1	6203	70.8
1994	6692.6	910	88.7	82.3	88.1	80.9	84.0	72.2	7658	87.4
1995	6725.5	910	87.9	82.8	85.6	81.2	84.4	73.1	7775	88.8
1996	6709.8	910	87.4	83.1	85.0	81.5	83.9	73.9	7587	86.4
1997	6769.9	910	88.7	83.5	84.8	81.7	84.9	74.6	7681	87.7
1998	6974.3	910	90.0	83.9	87.2	82.1	87.5	75.4	7883	90.0
1999	5836.2	910	75.1	83.4	73.1	81.5	73.2	75.3	6544	74.7
2000	4941.1	910	75.2	82.9	63.0	80.5	61.8	74.6	5592	63.7
2001	6548.0	910	83.6	83.0	81.9	80.6	82.1	75.0	7358	84.0
2002	5972.0	910	84.3	83.0	82.7	80.7	74.9	75.0	7357	84.0
2003	5181.2	910	66.0	82.2	63.7	79.9	65.0	74.5	5784	66.0
2004	6734.6	910	82.6	82.2	81.5	79.9	84.3	74.9	7346	83.6
2005	6918.8	910	85.0	82.3	84.6	80.1	86.8	75.4	7513	85.8

2006	6786.7	910	86.0	82.5	85.4	80.4	85.1	75.8	7599	86.7
2007	6035.6	910	75.8	82.2	74.3	80.1	75.7	75.8	6686	76.3
2008	7191.2	910	90.3	82.5	89.7	80.5	90.0	76.4	7977	90.8
2009	6050.5	910	83.6	82.6	75.0	80.3	75.9	76.4	6736	76.9
2010	6341.1	910	79.1	82.5	78.2	80.2	79.5	76.5	6919	79.0
2011	6516.2	910	81.2	82.4	81.0	80.2	81.7	76.7	7156	81.7
2012	6486.5	910	85.6	82.5	81.8	80.3	81.1	76.8	7345	83.6
2013	4891.2	910	64.2	81.9	61.7	79.7	61.4	76.3	5591	63.8
2014	6064.4	910	88.5	82.1	87.1	79.9	76.1	76.3	7030	80.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		322			220	
B. Refuelling without a maintenance				93		
C. Inspection, maintenance or repair combined with refuelling	550			1031	2	
D. Inspection, maintenance or repair without refuelling				20		
E. Testing of plant systems or components	8			61	0	
H. Nuclear regulatory requirements					15	
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			727			3
L. Human factor related					6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						54
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			121			7
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						8
Z. Other					23	
Subtotal	558	322	848	1205	266	75
Total		1728			1546	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		21
12. Reactor I&C Systems	31	5
13. Reactor Auxiliary Systems		7
14. Safety Systems	24	11
15. Reactor Cooling Systems		23
16. Steam generation systems		33
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries	81	24
32. Feedwater and Main Steam System		45
33. Circulating Water System		4
41. Main Generator Systems		8
42. Electrical Power Supply Systems	72	16
XX. Miscellaneous Systems	113	16
Total	321	215

## FR-34 BLAYAIS-3

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 910.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 4270.7 GW(e)·h

Energy Availability Factor: 55.5%

Load Factor: 53.6%

Operating Factor: 53.4%

Energy Unavailability Factor: 44.5%

Total Off-line Time: 4083 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	679.4	628.5	692.3	666.5	453.9	656.5	493.7	0.0	0.0	0.0	0.0	0.0	4270.7
EAF (%)	97.6	100.0	100.0	99.8	100.0	99.9	72.9	0.0	0.0	0.0	0.0	0.0	55.5
UCF (%)	97.6	100.0	100.0	99.8	100.0	99.9	77.4	0.0	0.0	0.0	0.0	0.0	55.9
LF (%)	100.3	102.8	102.4	101.7	67.0	100.2	72.9	0.0	0.0	0.0	0.0	0.0	53.6
OF (%)	100.0	100.0	100.0	100.0	67.2	100.0	77.7	0.0	0.0	0.0	0.0	0.0	53.4
EUf (%)	2.4	0.0	0.0	0.2	0.0	0.1	27.1	100.0	100.0	100.0	100.0	100.0	44.5
PUf (%)	0.4	0.0	0.0	0.2	0.0	0.1	22.6	100.0	100.0	100.0	100.0	100.0	43.9
UCLF (%)	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.1	4.5	0.0	0.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Apr 1978      Lifetime Generation: 192668.0 GW(e)·h

Date of First Criticality: 29 Jul 1983      Cumulative Energy Availability Factor: 80.2%

Date of Grid Connection: 17 Aug 1983      Cumulative Load Factor: 77.2%

Date of Commercial Operation: 14 Nov 1983      Cumulative Unit Capability Factor: 82.2%

Cumulative Energy Unavailability Factor: 19.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	1164.0	910	87.4	87.4	87.4	87.4	87.4	87.4	1273	87.0
1984	5944.0	910	80.3	81.4	80.3	81.4	74.4	76.2	7055	80.3
1985	6568.9	910	87.0	83.9	86.6	83.8	82.4	79.1	7729	88.2
1986	6504.9	910	88.3	85.3	88.1	85.1	81.6	79.9	7759	88.6
1987	4304.7	910	93.9	87.4	93.5	87.1	54.0	73.7	5473	62.5
1988	5287.0	910	82.8	86.5	81.6	86.1	66.1	72.2	6708	76.4
1989	6086.4	910	82.7	85.9	78.5	84.8	76.4	72.9	7292	83.2
1990	4871.2	910	64.3	82.9	62.8	81.8	61.1	71.2	5673	64.8
1991	6372.3	910	84.6	83.1	84.0	82.0	79.9	72.3	7448	85.0
1992	5967.9	910	83.0	83.1	81.8	82.0	74.7	72.6	7220	82.2
1993	6285.3	910	87.7	83.5	79.8	81.8	78.8	73.2	7728	88.2
1994	4212.8	910	57.8	81.2	57.7	79.6	52.8	71.4	4979	56.8
1995	6739.6	910	85.9	81.6	85.4	80.1	84.5	72.4	7525	85.9
1996	6924.1	910	87.1	82.0	86.8	80.6	86.6	73.5	7744	88.2
1997	6614.1	910	86.4	82.3	86.4	81.0	83.0	74.2	7659	87.4
1998	6970.2	910	90.1	82.8	87.8	81.5	87.4	75.1	7954	90.8
1999	5123.0	910	66.8	81.9	64.2	80.4	64.3	74.4	5861	66.9
2000	6183.6	910	80.3	81.8	78.2	80.3	77.4	74.6	7143	81.3
2001	6707.1	910	85.4	82.0	84.2	80.5	84.1	75.1	7540	86.1
2002	6882.0	910	87.5	82.2	86.4	80.8	86.3	75.7	7682	87.7
2003	5844.9	910	86.5	82.5	73.6	80.4	73.3	75.6	6725	76.8
2004	5822.8	910	75.2	82.1	72.5	80.1	72.8	75.4	6699	76.3
2005	5868.1	910	80.3	82.0	76.4	79.9	73.6	75.4	6875	78.5

2006	6515.7	910	82.8	82.1	81.5	80.0	81.7	75.6	7340	83.8
2007	7441.7	910	90.9	82.4	90.9	80.4	93.4	76.4	8035	91.7
2008	7138.3	910	87.0	82.6	86.8	80.7	89.3	76.9	7676	87.4
2009	6134.5	910	87.1	82.8	75.8	80.5	77.0	76.9	6949	79.3
2010	6679.7	910	83.1	82.8	82.2	80.6	83.8	77.1	7390	84.4
2011	6925.3	910	88.2	83.0	85.7	80.7	86.9	77.5	7769	88.7
2012	6747.8	910	83.9	83.0	83.0	80.8	84.4	77.7	7436	84.7
2013	6944.3	910	86.1	83.1	85.4	81.0	87.1	78.0	7535	86.0
2014	4270.7	910	55.9	82.2	55.5	80.2	53.6	77.2	4677	53.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					266	
B. Refuelling without a maintenance				62		
C. Inspection, maintenance or repair combined with refuelling	3838			888	5	
D. Inspection, maintenance or repair without refuelling				22	0	
E. Testing of plant systems or components				5	0	
H. Nuclear regulatory requirements					24	
J. Grid limitation, failure or grid unavailability			251			
L. Human factor related					2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						34
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					0	8
Z. Other					52	12
Subtotal	3838	0	251	977	349	54
Total		4089			1380	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		30
14. Safety Systems		8
15. Reactor Cooling Systems		9
16. Steam generation systems		58
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		8
33. Circulating Water System		0
41. Main Generator Systems		35
42. Electrical Power Supply Systems		16
XX. Miscellaneous Systems		52
Total	0	259

# FR-35 BLAYAIS-4

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 910.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6463.8 GW(e)·h

Energy Availability Factor: 84.4%

Load Factor: 81.1%

Operating Factor: 86.4%

Energy Unavailability Factor: 15.6%

Total Off-line Time: 1194 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	673.8	331.7	614.2	648.2	110.9	367.2	620.4	598.5	619.4	616.2	609.9	653.5	6463.8
EAF (%)	100.0	54.7	90.8	98.8	16.4	56.1	97.9	99.5	99.2	97.5	100.0	99.6	84.4
UCF (%)	100.0	54.7	90.8	98.8	16.4	56.7	98.7	99.9	99.9	99.9	100.0	99.6	84.8
LF (%)	99.5	54.2	90.8	98.9	16.4	56.0	91.6	88.4	94.5	90.9	93.1	96.5	81.1
OF (%)	100.0	56.5	100.0	100.0	16.5	61.4	99.6	100.0	100.0	100.0	100.0	100.0	86.4
EUf (%)	0.0	45.3	9.2	1.2	83.6	43.9	2.1	0.5	0.8	2.5	0.0	0.4	15.6
PUf (%)	0.0	0.1	0.0	0.0	83.6	43.2	0.1	0.1	0.1	0.1	0.0	0.2	10.7
UCLF (%)	0.0	45.3	9.2	1.2	0.0	0.2	1.2	0.0	0.0	0.0	0.0	0.2	4.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.6	0.7	0.4	0.7	2.4	0.0	0.0	0.4

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

BASE LOAD

## 5. Historical Summary

Date of Construction Start: 01 Apr 1978      Lifetime Generation: 189043.1 GW(e)·h

Date of First Criticality: 01 May 1983      Cumulative Energy Availability Factor: 79.4%

Date of Grid Connection: 16 May 1983      Cumulative Load Factor: 75.3%

Date of Commercial Operation: 01 Oct 1983      Cumulative Unit Capability Factor: 81.7%

Cumulative Energy Unavailability Factor: 20.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	1898.0	910	93.5	93.5	93.5	93.5	94.5	94.5	2092	94.7
1984	6012.0	910	76.0	79.5	76.0	79.5	75.2	79.1	6780	77.2
1985	5972.6	910	78.8	79.2	78.7	79.2	74.9	77.2	7024	80.2
1986	6278.1	910	82.5	80.2	81.9	80.0	78.8	77.7	7412	84.6
1987	6104.6	910	85.6	81.5	83.9	80.9	76.6	77.4	7437	84.9
1988	4337.0	910	71.5	79.6	70.2	78.9	54.3	73.0	5662	64.5
1989	5816.3	910	89.4	81.1	87.5	80.2	73.0	73.0	7250	82.8
1990	5912.3	910	83.4	81.5	78.2	80.0	74.2	73.2	7347	83.9
1991	5467.7	910	73.5	80.5	73.1	79.1	68.6	72.6	6496	74.2
1992	6120.6	910	84.1	80.9	83.5	79.6	76.6	73.0	7430	84.6
1993	5096.4	910	85.3	81.3	72.9	78.9	63.9	72.2	6854	78.2
1994	5897.1	910	82.6	81.4	81.8	79.2	74.0	72.3	7308	83.4
1995	5342.4	910	75.2	80.9	71.5	78.6	67.0	71.9	6198	70.8
1996	6719.6	910	88.2	81.5	86.9	79.2	84.1	72.8	7761	88.4
1997	6497.2	910	89.1	82.0	86.6	79.7	81.5	73.4	7705	88.0
1998	6692.6	910	90.3	82.6	87.9	80.3	84.0	74.1	7930	90.5
1999	6161.2	910	83.3	82.6	80.2	80.3	77.3	74.3	7369	84.1
2000	5467.5	910	75.1	82.2	72.5	79.8	68.4	74.0	6559	74.7
2001	6370.0	910	82.4	82.2	82.1	79.9	79.9	74.3	7297	83.3
2002	6462.2	910	86.2	82.4	85.1	80.2	81.1	74.6	7623	87.0
2003	5311.1	910	72.9	81.9	68.4	79.6	66.6	74.2	6292	71.8
2004	6560.3	910	88.3	82.2	84.6	79.9	82.1	74.6	7749	88.2
2005	5454.7	910	71.5	81.7	69.6	79.4	68.4	74.3	6357	72.6



2006	6758.4	910	88.5	82.0	86.5	79.7	84.8	74.8	7827	89.3
2007	6607.8	910	84.7	82.1	84.2	79.9	82.9	75.1	7484	85.4
2008	6755.7	910	87.4	82.3	87.0	80.2	84.5	75.5	7760	88.3
2009	4574.3	910	70.8	81.9	58.3	79.3	57.4	74.8	5295	60.4
2010	6723.7	910	86.6	82.1	85.5	79.6	84.3	75.1	7718	88.1
2011	6138.1	910	79.4	82.0	79.1	79.5	77.0	75.2	7079	80.8
2012	6615.1	910	86.2	82.1	83.7	79.7	82.8	75.5	7653	87.1
2013	5146.8	910	66.3	81.6	64.8	79.2	64.6	75.1	5924	67.6
2014	6463.8	910	84.8	81.7	84.4	79.4	81.1	75.3	7566	86.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2			318	
B. Refuelling without a maintenance	898			67		
C. Inspection, maintenance or repair combined with refuelling				940	27	
D. Inspection, maintenance or repair without refuelling				6	8	
E. Testing of plant systems or components				1	0	
H. Nuclear regulatory requirements					8	
L. Human factor related		291			6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						21
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						31
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						1
Z. Other					30	5
Subtotal	898	293	0	1014	397	58
Total		1191			1469	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		50
13. Reactor Auxiliary Systems		11
14. Safety Systems		38
15. Reactor Cooling Systems		7
16. Steam generation systems		39
21. Fuel Handling and Storage Facilities		21
31. Turbine and auxiliaries	2	45
32. Feedwater and Main Steam System		6
33. Circulating Water System		8
41. Main Generator Systems		41
42. Electrical Power Supply Systems		21
XX. Miscellaneous Systems		25
Total	2	313

## FR-13 BUGEY-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 920.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6386.1 GW(e)·h

Energy Availability Factor: 82.1%

Load Factor: 80.1%

Operating Factor: 84.4%

Energy Unavailability Factor: 17.9%

Total Off-line Time: 1370 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	618.5	603.0	669.6	613.1	658.9	595.0	659.0	653.7	368.6	0.0	354.0	592.7	6386.1
EAF (%)	100.0	99.9	100.0	94.9	99.9	95.6	97.7	96.7	56.3	0.0	56.6	88.7	82.1
UCF (%)	100.0	99.9	100.0	94.9	99.9	97.8	99.4	100.0	63.3	0.0	59.9	88.7	83.5
LF (%)	91.3	98.6	99.0	93.6	97.3	90.8	97.3	96.5	56.3	0.0	54.0	87.5	80.1
OF (%)	100.0	100.0	100.0	95.3	100.0	100.0	100.0	100.0	63.6	0.0	65.4	89.2	84.4
EUf (%)	0.0	0.1	0.0	5.1	0.1	4.4	2.3	3.3	43.7	100.0	43.4	11.3	17.9
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.7	100.0	39.7	0.0	14.8
UCLF (%)	0.0	0.1	0.0	5.1	0.1	2.2	0.6	0.0	0.0	0.0	0.4	11.3	1.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	2.1	1.7	3.3	7.0	0.0	3.3	0.0	1.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Nov 1972      Lifetime Generation: 196845.8 GW(e)·h

Date of First Criticality: 20 Apr 1978      Cumulative Energy Availability Factor: 72.6%

Date of Grid Connection: 10 May 1978      Cumulative Load Factor: 68.1%

Date of Commercial Operation: 01 Mar 1979      Cumulative Unit Capability Factor: 74.6%

Cumulative Energy Unavailability Factor: 27.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979	3535.0	925	53.2	53.2	53.2	53.2	52.0	52.0	4442	60.5
1980	4460.0	920	55.7	54.5	55.7	54.5	55.2	53.7	5271	60.0
1981	5209.6	920	65.2	58.3	65.2	58.3	64.6	57.6	6017	68.7
1982	3341.7	920	41.6	53.9	41.6	53.9	41.5	53.4	3863	44.1
1983	6725.0	920	85.3	60.4	85.3	60.4	83.4	59.6	7689	87.8
1984	5748.0	920	87.9	65.1	87.9	65.1	71.1	61.6	6580	74.9
1985	5948.8	920	79.7	67.3	76.0	66.7	73.8	63.4	7118	81.3
1986	5945.6	920	86.4	69.7	84.5	69.0	73.8	64.7	7515	85.8
1987	3581.1	920	53.4	67.9	51.6	67.0	44.4	62.4	4729	54.0
1988	4495.0	920	67.0	67.8	63.1	66.6	55.6	61.7	5718	65.1
1989	4700.8	920	64.7	67.5	61.1	66.1	58.3	61.4	5721	65.3
1990	4878.7	920	69.7	67.7	69.3	66.4	60.5	61.3	6213	70.9
1991	4927.2	920	66.7	67.6	64.4	66.2	61.1	61.3	6001	68.5
1992	3918.3	910	53.9	66.6	50.2	65.1	49.0	60.4	4781	54.4
1993	4509.9	910	99.2	68.8	94.2	67.0	56.6	60.2	5718	65.3
1994	5782.2	910	77.7	69.3	76.5	67.6	72.5	60.9	6811	77.8
1995	6045.7	910	79.6	70.0	78.1	68.2	75.8	61.8	7051	80.5
1996	5533.9	910	78.7	70.4	75.4	68.6	69.2	62.2	6863	78.1
1997	5477.7	910	84.4	71.2	81.0	69.3	68.7	62.6	6815	77.8
1998	5379.4	910	77.6	71.5	72.9	69.5	67.5	62.8	6605	75.4
1999	5960.3	910	78.9	71.9	77.5	69.9	74.8	63.4	7050	80.5
2000	5183.5	910	68.5	71.7	66.3	69.7	64.8	63.5	6025	68.6
2001	5685.9	910	72.3	71.7	72.2	69.8	71.3	63.8	6493	74.1

2002	5542.3	910	70.2	71.7	69.9	69.8	69.5	64.0	6212	70.9
2003	5521.7	910	74.8	71.8	71.0	69.9	69.3	64.2	6579	75.1
2004	7593.4	910	97.1	72.8	96.0	70.9	95.0	65.4	8571	97.6
2005	6373.9	910	86.7	73.3	81.7	71.3	80.0	66.0	7607	86.8
2006	6125.7	910	80.9	73.6	79.2	71.5	76.9	66.4	7158	81.7
2007	6925.1	910	88.7	74.1	87.6	72.1	86.9	67.1	7880	89.9
2008	6130.8	910	78.9	74.2	77.7	72.3	76.7	67.4	7517	85.6
2009	7285.3	910	99.0	75.0	96.1	73.1	91.4	68.2	8731	99.7
2010	2218.1	910	31.9	73.7	27.9	71.6	27.8	66.9	2732	31.2
2011	6127.5	910	82.1	73.9	79.6	71.9	76.9	67.2	7260	82.9
2012	7658.3	910	99.3	74.7	98.4	72.7	95.8	68.0	8712	99.2
2013	4679.3	910	61.2	74.3	60.4	72.3	58.7	67.8	5482	62.6
2014	6386.1	910	83.5	74.6	82.1	72.6	80.1	68.1	7390	84.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1979 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		113			537	
C. Inspection, maintenance or repair combined with refuelling	1227			1213	36	
D. Inspection, maintenance or repair without refuelling				104		
E. Testing of plant systems or components				9	0	
H. Nuclear regulatory requirements					36	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					13	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			24			19
Z. Other				2	83	
Subtotal	1227	113	24	1328	705	19
Total		1364			2052	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1979 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		202
12. Reactor I&C Systems		20
13. Reactor Auxiliary Systems		9
14. Safety Systems		58
15. Reactor Cooling Systems		29
16. Steam generation systems		15
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries	33	38
32. Feedwater and Main Steam System	61	22
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems	18	60
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		69
Total	112	530

# FR-14 BUGEY-3

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 920.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 7412.2 GW(e)·h

Energy Availability Factor: 97.7%

Load Factor: 93.0%

Operating Factor: 97.8%

Energy Unavailability Factor: 2.3%

Total Off-line Time: 197 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	593.2	609.1	673.0	598.2	670.7	540.5	634.0	505.8	612.2	672.0	656.7	646.6	7412.2
EAF (%)	99.1	99.4	100.0	91.5	100.0	90.3	100.0	100.0	97.9	99.2	99.9	94.9	97.7
UCF (%)	99.1	99.4	100.0	91.7	100.0	97.0	100.0	100.0	100.0	100.0	100.0	95.1	98.5
LF (%)	87.6	99.6	99.5	91.3	99.1	82.5	93.6	74.7	93.4	99.1	100.2	95.5	93.0
OF (%)	100.0	100.0	100.0	91.8	100.0	97.1	100.0	88.7	100.0	100.0	100.0	95.6	97.8
EUF (%)	0.9	0.6	0.0	8.5	0.0	9.7	0.0	0.0	2.1	0.8	0.1	5.1	2.3
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1
UCLF (%)	0.9	0.6	0.0	8.3	0.0	2.4	0.0	0.0	0.0	0.0	0.0	4.9	1.4
XUF (%)	0.0	0.0	0.0	0.2	0.0	6.7	0.0	0.0	2.1	0.8	0.1	0.2	0.8

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

BASE LOAD

## 5. Historical Summary

Date of Construction Start: 01 Sep 1973      Lifetime Generation: 188987.0 GW(e)·h

Date of First Criticality: 31 Aug 1978      Cumulative Energy Availability Factor: 70.6%

Date of Grid Connection: 21 Sep 1978      Cumulative Load Factor: 65.6%

Date of Commercial Operation: 01 Mar 1979      Cumulative Unit Capability Factor: 73.0%

Cumulative Energy Unavailability Factor: 29.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979	2744.0	925	39.9	39.9	39.9	39.9	40.4	40.4	3308	45.0
1980	5960.0	920	74.7	58.8	74.7	58.8	73.8	58.5	6951	79.1
1981	4849.6	920	61.0	59.6	61.0	59.6	60.2	59.1	5646	64.5
1982	6002.2	920	78.9	64.6	78.9	64.6	74.5	63.1	7661	87.5
1983	5525.0	920	74.0	66.5	74.0	66.5	68.6	64.2	6556	74.8
1984	5793.0	920	78.0	68.5	78.0	68.5	71.7	65.5	6905	78.6
1985	4571.1	920	58.7	67.1	57.2	66.8	56.7	64.2	5235	59.8
1986	6558.1	920	87.7	69.7	87.1	69.4	81.4	66.4	7634	87.1
1987	5482.5	920	78.4	70.7	76.4	70.2	68.0	66.6	6637	75.8
1988	3812.0	920	64.7	70.1	62.4	69.4	47.2	64.6	4935	56.2
1989	4914.3	920	88.7	71.8	87.4	71.1	61.0	64.3	6467	73.8
1990	4538.6	920	68.0	71.5	62.9	70.4	56.3	63.6	5474	62.5
1991	3442.8	920	55.7	70.2	51.7	68.9	42.7	62.0	4168	47.6
1992	2490.0	910	32.5	67.5	32.2	66.3	31.2	59.8	2879	32.8
1993	5954.4	910	80.2	68.4	76.1	67.0	74.7	60.8	7117	81.2
1994	4717.7	910	70.0	68.5	65.2	66.9	59.2	60.7	5872	67.0
1995	5535.7	910	95.9	70.1	95.2	68.5	69.4	61.2	6564	74.9
1996	5652.9	910	78.7	70.6	76.4	69.0	70.7	61.7	7012	79.8
1997	5596.6	910	75.0	70.8	74.9	69.3	70.2	62.2	6561	74.9
1998	6680.4	910	89.1	71.7	89.0	70.3	83.8	63.2	7875	89.9
1999	5786.6	910	77.6	72.0	77.3	70.6	72.6	63.7	7001	79.9
2000	5745.1	910	75.7	72.2	74.7	70.8	71.9	64.1	6765	77.0
2001	6230.6	910	81.8	72.6	81.2	71.2	78.2	64.7	7129	81.4

2002	4634.7	910	66.4	72.3	63.9	70.9	58.1	64.4	5654	64.5
2003	6646.1	910	97.2	73.3	85.2	71.5	83.4	65.2	7924	90.5
2004	6447.3	910	88.2	73.9	87.9	72.1	80.7	65.8	7461	84.9
2005	5805.4	910	82.3	74.2	76.8	72.3	72.8	66.0	7017	80.1
2006	6563.5	910	89.1	74.7	83.9	72.7	82.3	66.6	7624	87.0
2007	7277.8	910	93.4	75.4	91.4	73.4	91.3	67.5	8258	94.3
2008	5807.1	910	73.5	75.3	72.9	73.3	72.6	67.6	7352	83.7
2009	1984.8	910	31.0	73.9	25.0	71.8	24.9	66.3	2676	30.5
2010	0.0	910	12.9	72.0	0.0	69.5	0.0	64.2	0	0.0
2011	7184.5	910	96.7	72.7	92.1	70.2	90.1	65.0	8370	95.5
2012	5696.8	910	73.7	72.8	71.6	70.3	71.3	65.2	6487	73.9
2013	4321.8	910	55.4	72.3	55.1	69.8	54.2	64.8	4929	56.3
2014	7412.2	910	98.5	73.0	97.7	70.6	93.0	65.6	8563	97.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1979 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		103			772	
C. Inspection, maintenance or repair combined with refuelling				1071	35	
D. Inspection, maintenance or repair without refuelling				64		
E. Testing of plant systems or components	4			40	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				2		
H. Nuclear regulatory requirements					2	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			95			9
L. Human factor related					9	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						20
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant, spare part delivery problems etc.)					21	108
Z. Other					13	
Subtotal	4	103	95	1177	852	137
Total		202			2166	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1979 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		179
12. Reactor I&C Systems	17	6
13. Reactor Auxiliary Systems		13
14. Safety Systems		18
15. Reactor Cooling Systems		36
16. Steam generation systems	33	293
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries	53	41
32. Feedwater and Main Steam System		23
33. Circulating Water System		1
41. Main Generator Systems		93
42. Electrical Power Supply Systems		14
XX. Miscellaneous Systems		49
Total	103	766

# FR-15 BUGEY-4

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 880.0 MW(e)  
 Design Net Capacity: 900.0 MW(e)  
 Design Discharge Burnup: 33735 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5022.8 GW(e)·h  
 Energy Availability Factor: 68.5%  
 Load Factor: 65.2%  
 Operating Factor: 71.5%  
 Energy Unavailability Factor: 31.5%  
 Total Off-line Time: 2495 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	586.2	114.2	0.0	0.0	178.0	610.8	647.5	461.0	599.0	605.3	555.3	665.6	5022.8
EAF (%)	89.5	19.3	0.0	0.0	27.2	97.9	99.9	99.8	100.0	97.8	86.4	100.0	68.5
UCF (%)	99.9	25.0	0.0	3.3	27.2	99.6	99.9	99.8	100.0	99.5	88.6	100.0	70.6
LF (%)	89.5	19.3	0.0	0.0	27.2	96.4	98.9	70.4	94.5	92.3	87.6	101.7	65.2
OF (%)	100.0	25.4	0.0	0.0	38.8	100.0	100.0	100.0	100.0	100.0	89.4	100.0	71.5
EUUF (%)	10.5	80.7	100.0	100.0	72.8	2.1	0.1	0.2	0.0	2.2	13.6	0.0	31.5
PUF (%)	0.0	75.0	100.0	68.7	11.6	0.4	0.0	0.0	0.0	0.3	0.0	0.0	20.9
UCLF (%)	0.0	0.0	0.0	27.9	61.2	0.0	0.1	0.2	0.0	0.2	11.4	0.0	8.5
XUF (%)	10.4	5.7	0.0	3.3	0.0	1.7	0.0	0.0	0.0	1.7	2.2	0.0	2.1

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

BASE LOAD

## 5. Historical Summary

Date of Construction Start: 01 Jun 1974      Lifetime Generation: 191132.3 GW(e)·h  
 Date of First Criticality: 17 Feb 1979      Cumulative Energy Availability Factor: 73.9%  
 Date of Grid Connection: 08 Mar 1979      Cumulative Load Factor: 69.0%  
 Date of Commercial Operation: 01 Jul 1979      Cumulative Unit Capability Factor: 76.2%  
 Cumulative Energy Unavailability Factor: 26.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979	2323.0	900	64.6	64.6	64.6	64.6	58.4	58.4	2854	64.6
1980	5063.0	900	65.8	65.4	65.8	65.4	64.0	62.2	5983	68.1
1981	5671.9	900	75.6	69.5	75.6	69.5	71.9	66.1	6834	78.0
1982	5474.9	900	69.8	69.6	69.8	69.6	69.4	67.0	6276	71.6
1983	6329.0	900	83.3	72.6	83.2	72.6	80.3	70.0	7389	84.3
1984	5882.0	900	75.8	73.2	75.8	73.2	74.4	70.8	6896	78.5
1985	6224.4	900	87.2	75.3	86.7	75.3	78.9	72.0	7696	87.9
1986	5312.7	900	78.7	75.8	76.1	75.4	67.4	71.4	6622	75.6
1987	4670.9	900	79.8	76.3	78.2	75.7	59.2	70.0	6180	70.5
1988	3323.0	900	67.3	75.3	51.5	73.1	42.0	67.0	4524	51.5
1989	5541.3	900	76.7	75.5	76.2	73.4	70.3	67.3	6846	78.2
1990	3186.6	880	56.7	73.9	53.5	71.7	41.3	65.1	4312	49.2
1991	4984.9	880	71.8	73.7	69.3	71.6	64.7	65.1	6317	72.1
1992	1649.1	880	22.2	69.9	22.2	68.0	21.3	61.9	2012	22.9
1993	5748.6	880	82.2	70.8	74.2	68.4	74.6	62.8	7506	85.7
1994	5209.3	880	83.5	71.6	82.2	69.3	67.6	63.1	6619	75.6
1995	3989.9	880	64.3	71.1	59.1	68.7	51.8	62.4	4843	55.3
1996	4188.1	880	62.6	70.7	62.4	68.3	54.2	61.9	5333	60.7
1997	5652.5	880	83.6	71.3	80.7	69.0	73.3	62.5	7420	84.7
1998	6304.0	880	88.3	72.2	86.3	69.8	81.8	63.5	7791	88.9
1999	5591.3	880	81.5	72.7	77.5	70.2	72.5	63.9	7231	82.5
2000	5988.0	880	85.1	73.2	82.6	70.8	77.5	64.6	7544	85.9
2001	4746.0	880	65.8	72.9	63.4	70.5	61.6	64.4	5921	67.6

2002	5590.8	880	83.5	73.3	83.4	71.0	72.5	64.8	7130	81.4
2003	6645.3	880	95.6	74.2	94.2	71.9	86.2	65.6	8192	93.5
2004	6098.3	880	83.0	74.6	81.3	72.3	78.9	66.2	7367	83.9
2005	6073.2	880	84.0	74.9	80.3	72.6	78.8	66.6	7672	87.6
2006	6846.7	880	94.6	75.6	93.1	73.3	88.8	67.4	8341	95.2
2007	3586.2	880	47.2	74.7	46.8	72.4	46.5	66.7	4217	48.1
2008	6790.4	880	88.5	75.1	87.7	72.9	87.8	67.4	7891	89.8
2009	5094.3	880	75.2	75.1	67.5	72.8	66.1	67.4	6262	71.5
2010	7374.1	880	99.0	75.9	98.4	73.6	95.7	68.3	8674	99.0
2011	4458.3	880	59.3	75.4	58.8	73.1	57.8	67.9	5344	61.0
2012	6365.6	880	87.3	75.7	83.5	73.4	82.3	68.4	7529	85.7
2013	7125.8	880	96.2	76.3	95.4	74.1	92.4	69.1	8425	96.2
2014	5022.8	880	70.6	76.2	68.5	73.9	65.2	69.0	6265	71.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1979 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		716			563	
C. Inspection, maintenance or repair combined with refuelling	1740			1091	17	
D. Inspection, maintenance or repair without refuelling				87		
E. Testing of plant systems or components				10	0	
H. Nuclear regulatory requirements					7	
L. Human factor related					11	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			39			46
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						6
Z. Other					17	
Subtotal	1740	716	39	1188	615	52
Total		2495			1855	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1979 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		230
12. Reactor I&C Systems		18
13. Reactor Auxiliary Systems		3
14. Safety Systems	59	20
15. Reactor Cooling Systems		20
16. Steam generation systems		53
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		47
32. Feedwater and Main Steam System		14
33. Circulating Water System		2
35. All other I&C Systems		4
41. Main Generator Systems		31
42. Electrical Power Supply Systems		107
XX. Miscellaneous Systems	656	7
Total	715	556

# FR-16 BUGEY-5

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 880.0 MW(e)  
 Design Net Capacity: 900.0 MW(e)  
 Design Discharge Burnup: 33735 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5508.0 GW(e)·h  
 Energy Availability Factor: 72.4%  
 Load Factor: 71.5%  
 Operating Factor: 74.1%  
 Energy Unavailability Factor: 27.6%  
 Total Off-line Time: 2268 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	587.2	433.5	545.0	615.3	644.9	337.5	0.0	0.0	455.2	637.4	605.3	646.8	5508.0
EAF (%)	89.5	72.7	83.4	97.9	99.2	54.8	0.0	0.0	73.5	100.0	99.5	100.0	72.4
UCF (%)	89.5	72.8	87.2	97.9	99.2	54.8	0.0	0.0	76.9	100.0	99.5	100.0	73.0
LF (%)	89.7	73.3	83.4	97.1	98.5	53.3	0.0	0.0	71.8	97.2	95.5	98.8	71.5
OF (%)	92.7	74.4	84.0	98.8	100.0	55.7	0.0	0.0	85.1	100.0	100.0	100.0	74.1
EUf (%)	10.5	27.3	16.6	2.1	0.8	45.2	100.0	100.0	26.5	0.0	0.5	0.0	27.6
PUF (%)	0.0	25.1	12.8	0.0	0.0	33.1	100.0	100.0	18.3	0.0	0.0	0.0	24.2
UCLF (%)	10.5	2.1	0.0	2.1	0.8	12.1	0.0	0.0	4.9	0.0	0.5	0.0	2.7
XUF (%)	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.6

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Jul 1974      Lifetime Generation: 191776.9 GW(e)·h  
 Date of First Criticality: 15 Jul 1979      Cumulative Energy Availability Factor: 75.5%  
 Date of Grid Connection: 31 Jul 1979      Cumulative Load Factor: 70.2%  
 Date of Commercial Operation: 03 Jan 1980      Cumulative Unit Capability Factor: 77.9%  
    Cumulative Energy Unavailability Factor: 24.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	6589.0	900	84.5	84.5	84.5	84.5	83.3	83.3	8050	91.6
1981	4869.3	900	62.7	73.6	62.7	73.6	61.8	72.6	6061	69.2
1982	5738.5	900	76.4	74.5	76.4	74.5	72.8	72.6	6956	79.4
1983	5578.0	900	73.9	74.4	73.9	74.4	70.8	72.2	6649	75.9
1984	5778.0	900	74.1	74.3	74.1	74.3	73.1	72.4	6884	78.4
1985	6079.7	900	84.6	76.0	80.5	75.4	77.1	73.1	7314	83.5
1986	5465.5	900	75.7	76.0	75.5	75.4	69.3	72.6	6493	74.1
1987	5015.9	900	67.8	75.0	66.6	74.3	63.6	71.5	6044	69.0
1988	5466.0	900	89.7	76.6	84.6	75.4	69.1	71.2	6465	73.6
1989	4758.0	900	68.8	75.8	64.7	74.4	60.3	70.1	6185	70.6
1990	5586.0	880	80.7	76.3	74.9	74.4	72.5	70.3	7156	81.7
1991	3358.4	880	47.9	73.9	44.0	71.9	43.6	68.2	4258	48.6
1992	4035.0	880	56.4	72.6	52.5	70.5	52.2	66.9	5003	57.0
1993	4416.6	880	60.5	71.8	57.4	69.5	57.3	66.3	5329	60.8
1994	4487.3	880	85.9	72.7	85.7	70.6	58.2	65.7	6311	72.0
1995	5582.8	880	79.9	73.1	78.0	71.1	72.4	66.1	7060	80.6
1996	5361.4	880	79.0	73.5	77.5	71.4	69.4	66.3	6844	77.9
1997	5592.9	880	88.0	74.3	84.3	72.1	72.6	66.7	7302	83.4
1998	5320.4	880	83.9	74.8	80.5	72.6	69.0	66.8	6844	78.1
1999	6108.8	880	86.8	75.4	82.7	73.1	79.2	67.4	7679	87.7
2000	5403.2	880	77.3	75.5	74.6	73.1	69.9	67.5	6889	78.4
2001	4358.6	880	77.9	75.6	72.1	73.1	56.5	67.0	5604	64.0
2002	6146.9	880	91.0	76.2	91.0	73.9	79.7	67.6	7925	90.5



2003	5711.1	880	83.5	76.5	80.0	74.1	74.1	67.9	7220	82.4
2004	5256.1	880	72.7	76.4	71.4	74.0	68.0	67.9	6438	73.3
2005	7022.8	880	98.9	77.2	97.5	74.9	91.1	68.7	8573	97.9
2006	6118.1	880	88.5	77.6	86.6	75.3	79.4	69.1	7765	88.6
2007	5752.9	880	77.4	77.6	75.1	75.3	74.6	69.3	7051	80.5
2008	6302.5	880	87.0	78.0	84.3	75.6	81.5	69.7	7822	89.0
2009	6556.8	880	89.8	78.3	86.6	76.0	85.1	70.3	7935	90.6
2010	5927.5	880	89.1	78.7	80.1	76.1	76.9	70.5	7457	85.1
2011	3271.7	880	45.9	77.7	43.5	75.1	42.4	69.6	4079	46.6
2012	7133.8	880	98.7	78.3	98.3	75.8	92.3	70.3	8569	97.6
2013	5083.5	880	67.8	78.0	66.7	75.5	65.9	70.2	5997	68.5
2014	5508.0	880	73.0	77.9	72.4	75.5	71.5	70.2	6492	74.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		184			407	
C. Inspection, maintenance or repair combined with refuelling	1798			1201	10	
D. Inspection, maintenance or repair without refuelling	262			18		
E. Testing of plant systems or components	2			9	1	
H. Nuclear regulatory requirements					1	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						12
L. Human factor related					16	0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						5
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			30		8	19
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						5
Z. Other					47	11
Subtotal	2062	184	30	1228	490	53
Total		2276			1771	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		20
12. Reactor I&C Systems		42
13. Reactor Auxiliary Systems	140	9
14. Safety Systems	9	3
15. Reactor Cooling Systems		24
16. Steam generation systems		123
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		88
32. Feedwater and Main Steam System		6
33. Circulating Water System		2
41. Main Generator Systems		50
42. Electrical Power Supply Systems		7
XX. Miscellaneous Systems	34	22
Total	183	399

# FR-50 CATTENOM-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1300.0 MW(e)

Design Net Capacity: 1300.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 10106.2 GW(e)·h

Energy Availability Factor: 96.5%

Load Factor: 88.7%

Operating Factor: 96.1%

Energy Unavailability Factor: 3.5%

Total Off-line Time: 339 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	903.3	816.8	777.8	787.5	806.7	653.6	735.9	930.0	906.8	940.6	929.2	918.1	10106.2
EAF (%)	99.7	99.9	99.7	99.5	98.3	99.2	78.6	96.2	96.9	97.1	99.2	94.8	96.5
UCF (%)	99.9	100.0	100.0	99.9	98.8	99.8	86.1	98.8	99.3	99.0	99.7	95.0	98.0
LF (%)	93.4	93.5	80.5	84.1	83.4	69.8	76.1	96.2	96.9	97.1	99.3	94.9	88.7
OF (%)	100.0	100.0	87.5	100.0	100.0	88.6	82.4	100.0	100.0	100.0	100.0	95.6	96.1
EUf (%)	0.3	0.1	0.3	0.5	1.7	0.8	21.4	3.8	3.1	2.9	0.8	5.2	3.5
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.0	0.0
UCLF (%)	0.1	0.1	0.0	0.1	1.2	0.2	13.8	1.1	0.7	0.8	0.3	5.0	2.0
XUF (%)	0.2	0.0	0.3	0.4	0.5	0.7	7.5	2.6	2.4	1.9	0.4	0.2	1.4

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

BASE LOAD

## 5. Historical Summary

Date of Construction Start: 29 Oct 1979      Lifetime Generation: 223083.3 GW(e)·h

Date of First Criticality: 24 Oct 1986      Cumulative Energy Availability Factor: 74.1%

Date of Grid Connection: 13 Nov 1986      Cumulative Load Factor: 70.1%

Date of Commercial Operation: 01 Apr 1987      Cumulative Unit Capability Factor: 75.6%

Cumulative Energy Unavailability Factor: 25.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	5472.0	1265	69.5	69.5	68.8	68.8	65.5	65.5	4514	68.4
1988	5283.0	1300	47.8	57.0	47.4	56.4	46.3	54.4	4369	49.7
1989	6802.4	1300	60.3	58.2	60.3	57.8	59.7	56.4	5548	63.3
1990	7781.9	1300	75.7	62.9	75.3	62.5	68.3	59.6	6710	76.6
1991	1509.3	1300	13.5	52.4	13.5	52.2	13.3	49.8	1336	15.3
1992	7933.3	1300	71.5	55.8	71.0	55.5	69.5	53.2	6595	75.1
1993	6956.6	1300	63.5	56.9	61.5	56.3	61.1	54.4	5608	64.0
1994	6775.4	1300	64.1	57.8	64.0	57.3	59.5	55.0	6006	68.6
1995	6634.3	1300	59.8	58.1	59.5	57.6	58.3	55.4	6346	72.4
1996	9539.2	1300	87.5	61.1	87.3	60.6	83.5	58.3	7783	88.6
1997	8688.9	1300	84.1	63.2	81.4	62.6	76.3	60.0	7374	84.2
1998	9365.8	1300	85.9	65.2	85.7	64.5	82.2	61.9	7644	87.3
1999	8273.0	1300	79.8	66.3	76.3	65.5	72.6	62.7	7028	80.2
2000	8053.8	1300	81.0	67.4	78.1	66.4	70.5	63.3	6873	78.2
2001	9220.2	1300	96.4	69.3	96.4	68.4	81.0	64.5	8094	92.4
2002	8270.2	1300	79.4	70.0	79.2	69.1	72.6	65.0	7011	80.0
2003	8531.0	1300	80.4	70.6	78.4	69.7	74.9	65.6	7150	81.6
2004	9764.2	1300	96.9	72.1	96.4	71.2	85.5	66.7	8583	97.7
2005	9323.8	1300	89.1	73.0	83.2	71.8	81.9	67.5	7919	90.4
2006	7449.0	1300	71.5	72.9	68.6	71.7	65.4	67.4	6480	74.0
2007	9696.2	1300	94.0	73.9	92.4	72.7	85.1	68.3	8426	96.2
2008	9022.9	1300	82.2	74.3	79.2	73.0	79.0	68.8	7881	89.7
2009	7612.7	1300	73.1	74.3	68.4	72.8	66.8	68.7	6261	71.5

2010	9864.1	1300	89.4	74.9	87.6	73.4	86.6	69.4	7948	90.7
2011	10033.9	1300	98.2	75.9	96.7	74.3	88.1	70.2	8538	97.5
2012	6818.8	1300	63.1	75.4	60.3	73.8	59.7	69.8	5738	65.3
2013	6624.7	1300	59.7	74.8	59.2	73.2	58.2	69.4	5440	62.1
2014	10106.2	1300	98.0	75.6	96.5	74.1	88.7	70.1	8421	96.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		125			795	
B. Refuelling without a maintenance				67		
C. Inspection, maintenance or repair combined with refuelling				822	12	
D. Inspection, maintenance or repair without refuelling				42	6	
E. Testing of plant systems or components				52		
H. Nuclear regulatory requirements					6	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			180			
L. Human factor related					8	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			39		0	14
Z. Other					53	
Subtotal	0	125	219	983	880	15
Total		344			1878	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems		47
13. Reactor Auxiliary Systems		39
14. Safety Systems		10
15. Reactor Cooling Systems		70
16. Steam generation systems		35
17. Safety I&C Systems (excluding reactor I&C)		8
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	33	34
32. Feedwater and Main Steam System		71
33. Circulating Water System		21
35. All other I&C Systems		6
41. Main Generator Systems		295
42. Electrical Power Supply Systems		77
XX. Miscellaneous Systems	92	55
Total	125	788

## FR-53 CATTENOM-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1300.0 MW(e)  
 Design Net Capacity: 1300.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7475.6 GW(e)·h  
 Energy Availability Factor: 72.9%  
 Load Factor: 65.6%  
 Operating Factor: 74.6%  
 Energy Unavailability Factor: 27.1%  
 Total Off-line Time: 2225 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	955.0	534.2	908.6	315.4	0.0	19.9	724.2	674.3	840.7	844.7	831.5	827.0	7475.6
EAF (%)	98.7	61.1	94.1	33.7	0.0	2.1	91.4	98.2	98.0	95.9	99.5	99.2	72.9
UCF (%)	99.1	61.1	94.4	36.6	0.0	2.1	92.3	99.1	99.2	97.3	99.8	99.4	73.6
LF (%)	98.7	61.1	94.1	33.7	0.0	2.1	74.9	69.7	89.8	87.2	88.8	85.5	65.6
OF (%)	100.0	65.0	100.0	36.8	0.0	6.3	96.9	92.9	100.0	98.4	100.0	96.2	74.6
EUf (%)	1.3	38.9	5.9	66.3	100.0	97.9	8.6	1.8	2.0	4.1	0.5	0.8	27.1
PUf (%)	0.0	0.0	0.0	63.4	100.0	92.0	3.0	0.0	0.0	0.0	0.0	0.0	21.5
UCLF (%)	0.9	38.9	5.6	0.0	0.0	5.9	4.7	0.9	0.8	2.7	0.2	0.6	4.9
XUF (%)	0.4	0.0	0.3	2.9	0.0	0.0	0.9	0.8	1.1	1.4	0.3	0.2	0.7

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 28 Jul 1980      Lifetime Generation: 224633.5 GW(e)·h  
 Date of First Criticality: 07 Aug 1987      Cumulative Energy Availability Factor: 77.7%  
 Date of Grid Connection: 17 Sep 1987      Cumulative Load Factor: 72.7%  
 Date of Commercial Operation: 01 Feb 1988      Cumulative Unit Capability Factor: 79.9%  
    Cumulative Energy Unavailability Factor: 22.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	7457.0	1300	91.0	91.0	90.8	90.8	71.3	71.3	6588	81.9
1989	1765.5	1300	16.5	52.2	15.5	51.5	15.5	42.2	1452	16.6
1990	8137.6	1300	83.0	62.7	82.7	62.2	71.5	52.2	6670	76.1
1991	7543.1	1300	71.7	65.0	68.2	63.7	66.2	55.8	6472	73.9
1992	8134.3	1300	75.6	67.2	72.4	65.5	71.2	59.0	6752	76.9
1993	8627.0	1300	78.8	69.2	76.2	67.3	75.8	61.8	6990	79.8
1994	8526.3	1300	80.5	70.8	77.7	68.8	74.9	63.7	7158	81.7
1995	8603.7	1300	79.9	71.9	78.3	70.0	75.6	65.2	7138	81.5
1996	9018.1	1300	99.6	75.1	98.1	73.2	79.0	66.7	7804	88.8
1997	8487.4	1300	84.4	76.0	82.2	74.1	74.5	67.5	7503	85.7
1998	7259.5	1300	69.0	75.3	68.0	73.5	63.7	67.2	6144	70.1
1999	9367.5	1300	90.2	76.6	87.3	74.7	82.3	68.4	7781	88.8
2000	9164.3	1300	88.6	77.5	88.6	75.7	80.3	69.4	7868	89.6
2001	8649.0	1300	79.4	77.7	77.5	75.9	75.9	69.8	7033	80.3
2002	8288.0	1300	76.9	77.6	76.9	75.9	72.8	70.0	6918	79.0
2003	10197.5	1300	99.3	79.0	93.5	77.0	89.5	71.3	8217	93.8
2004	7368.2	1300	68.7	78.4	66.8	76.4	64.5	70.9	6183	70.4
2005	9247.8	1300	87.9	78.9	84.7	76.9	81.2	71.4	7845	89.6
2006	9870.3	1300	98.0	79.9	96.1	77.9	86.7	72.2	8626	98.5
2007	9526.5	1300	87.8	80.3	85.7	78.3	83.7	72.8	7758	88.6
2008	7707.8	1300	71.7	79.9	69.5	77.9	67.5	72.6	6356	72.4
2009	9460.9	1300	88.1	80.3	85.1	78.2	83.1	73.0	7845	89.6
2010	8866.2	1300	94.7	80.9	89.4	78.7	77.9	73.2	8001	91.3

2011	7188.8	1300	66.6	80.3	64.3	78.1	63.1	72.8	5995	68.4
2012	7149.6	1300	69.2	79.8	65.5	77.6	62.6	72.4	5981	68.1
2013	9766.2	1300	87.8	80.2	86.6	77.9	85.8	72.9	7830	89.4
2014	7475.6	1300	73.6	79.9	72.9	77.7	65.6	72.7	6535	74.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		317			493	
B. Refuelling without a maintenance				48		
C. Inspection, maintenance or repair combined with refuelling	1831			832	6	
D. Inspection, maintenance or repair without refuelling				48	16	
E. Testing of plant systems or components				43	0	1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			79			
L. Human factor related					14	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						9
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						10
Z. Other					30	23
Subtotal	1831	317	79	971	559	43
Total		2227			1573	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems	80	5
13. Reactor Auxiliary Systems		5
14. Safety Systems	214	26
15. Reactor Cooling Systems		147
16. Steam generation systems	5	70
31. Turbine and auxiliaries	4	15
32. Feedwater and Main Steam System		15
33. Circulating Water System		1
35. All other I&C Systems	5	2
41. Main Generator Systems		64
42. Electrical Power Supply Systems	6	20
XX. Miscellaneous Systems		110
Total	314	489

# FR-60 CATTENOM-3

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1300.0 MW(e)  
 Design Net Capacity: 1300.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9671.6 GW(e)·h  
 Energy Availability Factor: 92.1%  
 Load Factor: 84.9%  
 Operating Factor: 91.9%  
 Energy Unavailability Factor: 7.9%  
 Total Off-line Time: 711 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	459.3	800.9	879.0	840.2	867.6	834.6	698.3	781.7	892.6	739.6	918.1	959.8	9671.6
EAF (%)	47.7	99.8	99.1	98.7	98.7	98.2	93.3	97.8	97.3	77.5	98.9	99.3	92.1
UCF (%)	47.7	99.8	99.2	99.2	99.3	99.3	95.8	99.2	99.0	78.2	99.1	99.5	92.8
LF (%)	47.5	91.7	91.0	89.8	89.7	89.2	72.2	80.8	95.4	76.4	98.1	99.2	84.9
OF (%)	53.9	100.0	100.0	100.0	98.3	100.0	80.5	86.2	100.0	85.6	100.0	100.0	91.9
EUf (%)	52.3	0.2	0.9	1.3	1.3	1.8	6.7	2.2	2.7	22.5	1.1	0.7	7.9
PUF (%)	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.5
UCLF (%)	47.2	0.2	0.7	0.8	0.7	0.8	4.2	0.8	1.0	21.6	0.9	0.5	6.7
XUF (%)	0.0	0.0	0.1	0.5	0.6	1.0	2.5	1.4	1.7	0.7	0.2	0.2	0.7

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 15 Jun 1982      Lifetime Generation: 204298.4 GW(e)·h  
 Date of First Criticality: 16 Feb 1990      Cumulative Energy Availability Factor: 79.2%  
 Date of Grid Connection: 06 Jul 1990      Cumulative Load Factor: 74.2%  
 Date of Commercial Operation: 01 Feb 1991      Cumulative Unit Capability Factor: 81.1%  
    Cumulative Energy Unavailability Factor: 20.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1991	8931.1	1300	89.6	89.6	88.2	88.2	85.7	85.7	7255	90.5
1992	7145.0	1300	67.0	77.8	65.6	76.4	62.6	73.6	5903	67.2
1993	8035.1	1300	81.2	78.9	75.9	76.2	70.6	72.6	6858	78.3
1994	8613.3	1300	85.7	80.7	84.4	78.3	75.6	73.3	7464	85.2
1995	8344.3	1300	82.2	81.0	78.9	78.4	73.3	73.3	7269	83.0
1996	8264.7	1300	80.6	80.9	77.3	78.2	72.4	73.2	7184	81.8
1997	9504.1	1300	94.5	82.9	93.2	80.4	83.5	74.7	8097	92.4
1998	8054.9	1300	83.5	83.0	80.2	80.4	70.7	74.2	7175	81.9
1999	8237.0	1300	83.5	83.0	79.7	80.3	72.3	74.0	7169	81.8
2000	8933.5	1300	99.1	84.6	98.7	82.2	78.2	74.4	7984	90.9
2001	3171.5	1300	29.8	79.6	29.7	77.4	27.8	70.1	2739	31.3
2002	9402.5	1300	83.6	80.0	82.5	77.8	82.6	71.2	7443	85.0
2003	11254.0	1300	99.3	81.5	98.4	79.4	98.8	73.3	8715	99.5
2004	9162.7	1300	81.4	81.5	80.3	79.5	80.2	73.8	7274	82.8
2005	9757.0	1300	89.2	82.0	86.7	79.9	85.7	74.6	7944	90.7
2006	8045.3	1300	79.9	81.8	76.5	79.7	70.6	74.4	7088	80.9
2007	9500.6	1300	99.3	82.9	98.5	80.8	83.4	74.9	8559	97.7
2008	8712.7	1300	80.5	82.7	78.4	80.7	76.3	75.0	7145	81.3
2009	6649.8	1300	60.4	81.6	58.7	79.5	58.4	74.1	5277	60.2
2010	8756.8	1300	83.0	81.6	81.7	79.6	76.9	74.2	6966	79.5
2011	7918.6	1300	70.8	81.1	69.6	79.2	69.5	74.0	6306	72.0
2012	8337.7	1300	75.9	80.9	74.5	78.9	73.0	74.0	6760	77.0
2013	7844.6	1300	74.3	80.6	72.6	78.7	68.9	73.7	6552	74.8

2014	9671.6	1300	92.8	81.1	92.1	79.2	84.9	74.2	8049	91.9
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## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		466			424	
B. Refuelling without a maintenance				24		
C. Inspection, maintenance or repair combined with refuelling				879	15	
D. Inspection, maintenance or repair without refuelling				52		
E. Testing of plant systems or components				13		
H. Nuclear regulatory requirements					92	
J. Grid limitation, failure or grid unavailability						15
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			248			7
L. Human factor related					5	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					0	10
Z. Other					30	
Subtotal	0	466	248	968	566	32
Total		714			1566	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		75
12. Reactor I&C Systems		32
13. Reactor Auxiliary Systems		44
14. Safety Systems		27
15. Reactor Cooling Systems		10
16. Steam generation systems		32
21. Fuel Handling and Storage Facilities		10
31. Turbine and auxiliaries	166	15
32. Feedwater and Main Steam System	9	12
41. Main Generator Systems		96
42. Electrical Power Supply Systems		5
XX. Miscellaneous Systems	290	62
Total	465	420

# FR-65 CATTENOM-4

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1300.0 MW(e)  
 Design Net Capacity: 1300.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8851.4 GW(e)·h  
 Energy Availability Factor: 81.0%  
 Load Factor: 77.7%  
 Operating Factor: 82.6%  
 Energy Unavailability Factor: 19.0%  
 Total Off-line Time: 1520 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	964.8	859.8	897.7	723.1	885.0	865.5	932.3	665.0	0.0	279.5	870.8	907.9	8851.4
EAF (%)	99.9	99.9	98.1	82.8	99.4	98.6	96.6	68.9	0.0	29.2	99.7	99.9	81.0
UCF (%)	99.9	99.9	98.3	83.1	99.7	99.6	99.4	70.2	0.0	29.2	99.8	99.9	81.5
LF (%)	99.7	98.4	92.9	77.2	91.5	92.5	96.4	68.8	0.0	28.9	93.0	93.9	77.7
OF (%)	100.0	100.0	100.0	84.2	100.0	100.0	100.0	71.2	0.0	36.6	100.0	100.0	82.6
EUf (%)	0.1	0.1	1.9	17.2	0.6	1.4	3.4	31.1	100.0	70.8	0.3	0.1	19.0
PUf (%)	0.0	0.0	0.0	16.4	0.0	0.0	0.0	29.2	100.0	65.5	0.0	0.0	17.6
UCLF (%)	0.1	0.1	1.7	0.5	0.3	0.4	0.6	0.6	0.0	5.3	0.2	0.1	0.8
XUF (%)	0.0	0.0	0.1	0.3	0.3	1.0	2.8	1.4	0.0	0.0	0.1	0.0	0.5

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 28 Sep 1983      Lifetime Generation: 203336.6 GW(e)·h  
 Date of First Criticality: 04 May 1991      Cumulative Energy Availability Factor: 82.1%  
 Date of Grid Connection: 27 May 1991      Cumulative Load Factor: 76.8%  
 Date of Commercial Operation: 01 Jan 1992      Cumulative Unit Capability Factor: 83.8%  
 Cumulative Energy Unavailability Factor: 17.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1992	9356.0	1300	88.0	88.0	85.8	85.8	81.9	81.9	7649	87.1
1993	7736.4	1300	79.1	83.6	78.0	81.9	67.9	74.9	6251	71.4
1994	7828.8	1300	81.9	83.0	80.4	81.4	68.7	72.9	6866	78.4
1995	8942.4	1300	85.5	83.6	82.8	81.8	78.5	74.3	7563	86.3
1996	8897.6	1300	82.6	83.4	81.3	81.7	77.9	75.0	7399	84.2
1997	8690.5	1300	82.6	83.3	79.3	81.3	76.3	75.2	7382	84.3
1998	10000.1	1300	96.1	85.1	94.5	83.2	87.8	77.0	8476	96.8
1999	8131.9	1300	82.9	84.8	80.8	82.9	71.4	76.3	7164	81.8
2000	9139.0	1300	86.6	85.0	85.1	83.1	80.0	76.7	7692	87.6
2001	8593.2	1300	86.6	85.2	84.8	83.3	75.5	76.6	7375	84.2
2002	10598.8	1300	95.3	86.1	95.1	84.4	93.1	78.1	8467	96.7
2003	7708.3	1300	72.1	84.9	69.8	83.1	67.7	77.2	6406	73.1
2004	9311.8	1300	85.0	84.9	84.5	83.2	81.5	77.6	7560	86.1
2005	9913.9	1300	98.3	85.9	97.8	84.3	87.1	78.2	8520	97.3
2006	8719.6	1300	83.5	85.7	80.6	84.0	76.6	78.1	7440	84.9
2007	8562.2	1300	78.4	85.3	77.1	83.6	75.2	78.0	6999	79.9
2008	9538.8	1300	89.8	85.5	87.9	83.9	83.5	78.3	7975	90.8
2009	10010.1	1300	99.1	86.3	97.7	84.6	87.9	78.8	8733	99.7
2010	7502.2	1300	73.2	85.6	70.4	83.9	65.9	78.1	6677	76.2
2011	9152.8	1300	88.4	85.8	85.2	83.9	80.4	78.2	7786	88.9
2012	8090.8	1300	76.0	85.3	75.4	83.5	70.9	77.9	6692	76.2
2013	6000.8	1300	54.3	83.9	54.0	82.2	52.7	76.7	4913	56.1
2014	8851.4	1300	81.5	83.8	81.0	82.1	77.7	76.8	7240	82.6



## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1991 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		39			291	1
B. Refuelling without a maintenance	1367					
C. Inspection, maintenance or repair combined with refuelling				854	27	
D. Inspection, maintenance or repair without refuelling	113			47		
E. Testing of plant systems or components				53		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						27
L. Human factor related					16	11
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					2	1
Z. Other					8	
Subtotal	1480	39	0	954	344	40
Total		1519			1338	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1991 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		11
13. Reactor Auxiliary Systems		4
14. Safety Systems		31
16. Steam generation systems		7
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		10
31. Turbine and auxiliaries		37
32. Feedwater and Main Steam System		11
33. Circulating Water System		2
35. All other I&C Systems		2
41. Main Generator Systems		117
42. Electrical Power Supply Systems		17
XX. Miscellaneous Systems	39	30
Total	39	283

# FR-40 CHINON B-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 905.0 MW(e)

Design Net Capacity: 870.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6524.2 GW(e)·h

Energy Availability Factor: 83.2%

Load Factor: 82.3%

Operating Factor: 85.3%

Energy Unavailability Factor: 16.8%

Total Off-line Time: 1287 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	671.1	606.5	617.9	645.7	661.1	555.8	647.7	167.1	130.7	633.7	601.0	586.0	6524.2
EAF (%)	99.7	99.7	92.2	99.6	98.9	85.6	97.1	24.9	20.1	96.8	96.6	87.5	83.2
UCF (%)	99.7	99.7	93.0	99.6	99.0	86.4	98.4	25.9	20.2	99.3	98.7	87.6	83.9
LF (%)	99.7	99.7	91.9	99.1	98.2	85.3	96.2	24.8	20.1	94.0	92.2	87.0	82.3
OF (%)	100.0	100.0	93.4	100.0	100.0	90.1	99.7	25.9	24.6	100.0	100.0	90.5	85.3
EUf (%)	0.3	0.3	7.8	0.4	1.1	14.4	2.9	75.1	79.9	3.2	3.4	12.5	16.8
PUF (%)	0.1	0.1	0.1	0.0	0.2	0.0	0.2	73.7	29.8	0.1	0.1	0.1	8.8
UCLF (%)	0.3	0.2	7.0	0.4	0.9	13.6	1.4	0.3	50.0	0.6	1.2	12.3	7.3
XUF (%)	0.0	0.0	0.8	0.0	0.0	0.8	1.3	1.0	0.1	2.5	2.1	0.0	0.7

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Mar 1977      Lifetime Generation: 181269.0 GW(e)·h

Date of First Criticality: 28 Oct 1982      Cumulative Energy Availability Factor: 76.4%

Date of Grid Connection: 30 Nov 1982      Cumulative Load Factor: 72.8%

Date of Commercial Operation: 01 Feb 1984      Cumulative Unit Capability Factor: 78.2%

Cumulative Energy Unavailability Factor: 23.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	3925.0	870	57.6	57.6	57.6	57.6	56.1	56.1	4835	60.1
1985	5978.2	870	84.5	71.6	82.1	70.4	78.4	67.8	7402	84.5
1986	6322.2	870	86.1	76.6	86.1	75.7	83.0	73.0	7609	86.9
1987	4914.1	870	73.7	75.8	72.9	75.0	64.5	70.8	6438	73.5
1988	5271.0	870	97.4	80.2	96.2	79.3	69.0	70.4	7195	81.9
1989	4734.3	870	64.4	77.5	63.6	76.7	62.1	69.0	5724	65.3
1990	5913.0	870	79.3	77.8	79.1	77.0	77.6	70.3	7043	80.4
1991	5339.2	905	68.0	76.5	67.7	75.8	67.3	69.9	6033	68.9
1992	5972.0	905	80.9	77.0	80.6	76.4	75.1	70.5	7133	81.2
1993	5651.7	905	77.7	77.1	73.3	76.0	71.3	70.6	6914	78.9
1994	5366.3	905	71.9	76.6	71.4	75.6	67.7	70.3	6347	72.5
1995	6333.9	905	85.6	77.4	84.4	76.4	79.9	71.1	7573	86.4
1996	6295.2	905	83.6	77.9	83.4	76.9	79.2	71.8	7476	85.1
1997	6093.3	905	81.9	78.2	81.8	77.3	76.9	72.1	7268	83.0
1998	6631.3	905	87.1	78.8	85.7	77.8	83.6	72.9	7759	88.6
1999	6214.0	905	84.3	79.1	82.1	78.1	78.4	73.3	7483	85.4
2000	6166.8	905	83.6	79.4	82.7	78.4	77.6	73.5	7416	84.4
2001	5769.0	905	82.6	79.6	81.2	78.5	72.8	73.5	7260	82.9
2002	6229.3	905	88.9	80.1	85.6	78.9	78.6	73.8	7671	87.6
2003	5181.7	905	71.0	79.6	68.4	78.4	65.4	73.3	6357	72.6
2004	6252.6	905	83.7	79.8	83.7	78.6	78.7	73.6	7536	85.8
2005	6465.8	905	84.5	80.0	83.9	78.9	81.5	74.0	7611	86.9
2006	6637.8	905	87.3	80.4	86.7	79.2	83.7	74.4	7873	89.9

2007	4538.8	905	61.0	79.5	57.7	78.3	57.3	73.7	5559	63.5
2008	6893.1	905	88.1	79.9	86.9	78.7	86.7	74.2	7862	89.5
2009	4345.8	905	78.5	79.8	55.1	77.7	54.8	73.4	5003	57.1
2010	4165.8	905	53.2	78.8	52.8	76.8	52.5	72.7	4893	55.9
2011	5808.3	905	73.7	78.6	73.6	76.7	73.3	72.7	6601	75.4
2012	6881.6	905	87.3	78.9	87.3	77.1	86.6	73.2	7766	88.4
2013	4078.9	905	52.3	78.0	51.6	76.2	51.5	72.4	4634	52.9
2014	6524.2	905	83.9	78.2	83.2	76.4	82.3	72.8	7473	85.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		552			462	
B. Refuelling without a maintenance	731			63		
C. Inspection, maintenance or repair combined with refuelling				1019	52	
E. Testing of plant systems or components				6	1	
H. Nuclear regulatory requirements					3	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					13	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					30	72
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					8	
Z. Other					23	
Subtotal	731	552	0	1088	592	76
Total		1283			1756	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems	32	24
14. Safety Systems	104	8
15. Reactor Cooling Systems	48	29
16. Steam generation systems		10
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		15
31. Turbine and auxiliaries	38	139
32. Feedwater and Main Steam System		19
33. Circulating Water System	71	
35. All other I&C Systems		1
41. Main Generator Systems	2	119
42. Electrical Power Supply Systems		26
XX. Miscellaneous Systems	254	49
Total	549	455

## FR-41 CHINON B-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 905.0 MW(e)  
 Design Net Capacity: 870.0 MW(e)  
 Design Discharge Burnup: 33735 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5721.4 GW(e)·h  
 Energy Availability Factor: 73.8%  
 Load Factor: 72.2%  
 Operating Factor: 74.9%  
 Energy Unavailability Factor: 26.2%  
 Total Off-line Time: 2195 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	616.7	574.6	230.0	0.0	0.0	594.0	634.1	461.0	629.0	664.6	646.3	671.0	5721.4
EAF (%)	99.8	94.5	34.2	0.0	0.0	91.8	98.6	72.7	98.6	98.9	99.4	99.2	73.8
UCF (%)	99.9	99.9	39.7	0.0	1.6	92.6	99.7	73.0	99.3	99.4	99.4	99.2	75.1
LF (%)	91.6	94.5	34.2	0.0	0.0	91.2	94.2	68.5	96.5	98.6	99.2	99.7	72.2
OF (%)	92.2	100.0	39.8	0.0	0.0	98.8	100.0	70.8	100.0	100.0	100.0	100.0	74.9
EUUF (%)	0.2	5.5	65.8	100.0	100.0	8.2	1.4	27.3	1.4	1.1	0.6	0.8	26.2
PUF (%)	0.0	0.1	54.5	100.0	37.5	5.8	0.1	0.1	0.1	0.1	0.4	0.0	16.6
UCLF (%)	0.1	0.0	5.8	0.0	60.9	1.6	0.3	26.9	0.7	0.5	0.2	0.7	8.3
XUF (%)	0.2	5.4	5.5	0.0	1.6	0.8	1.0	0.3	0.7	0.5	0.0	0.0	1.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Mar 1977      Lifetime Generation: 178199.6 GW(e)·h  
 Date of First Criticality: 23 Sep 1983      Cumulative Energy Availability Factor: 78.0%  
 Date of Grid Connection: 29 Nov 1983      Cumulative Load Factor: 73.6%  
 Date of Commercial Operation: 01 Aug 1984      Cumulative Unit Capability Factor: 79.3%  
 Cumulative Energy Unavailability Factor: 22.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	2423.0	870	91.7	91.7	91.7	91.7	75.8	75.8	2985	81.3
1985	5037.4	870	69.3	75.9	67.9	74.9	66.1	69.0	6201	70.8
1986	6215.1	870	86.4	80.3	86.0	79.5	81.6	74.2	7639	87.2
1987	5618.8	870	81.1	80.5	80.7	79.9	73.7	74.0	7171	81.9
1988	4425.0	870	68.4	77.8	67.3	77.0	57.9	70.4	5731	65.2
1989	6043.4	870	94.4	80.8	91.2	79.6	79.3	72.0	7873	89.9
1990	5217.0	870	84.4	81.4	84.1	80.3	68.5	71.5	6714	76.6
1991	3142.2	870	55.8	77.9	53.2	76.7	41.2	67.4	3921	44.8
1992	6295.4	870	82.0	78.4	80.8	77.2	82.4	69.2	7321	83.3
1993	5491.6	870	81.4	78.7	76.2	77.1	72.1	69.5	6867	78.4
1994	6174.6	905	84.7	79.3	83.9	77.7	77.9	70.3	7407	84.6
1995	6356.3	905	86.1	79.9	86.0	78.5	80.2	71.2	7741	88.4
1996	5287.6	905	69.6	79.1	69.4	77.7	66.5	70.8	6206	70.7
1997	6637.9	905	86.5	79.7	85.2	78.3	83.7	71.8	7622	87.0
1998	6186.4	905	80.4	79.7	79.9	78.4	78.0	72.3	7136	81.5
1999	5900.9	905	79.1	79.7	79.0	78.5	74.4	72.4	7075	80.8
2000	6177.0	905	81.2	79.8	80.8	78.6	77.7	72.7	7260	82.7
2001	6646.2	905	88.5	80.3	87.5	79.1	83.8	73.4	7846	89.6
2002	6155.6	905	86.2	80.6	85.4	79.5	77.6	73.6	7404	84.5
2003	5746.2	905	81.3	80.6	78.7	79.4	72.5	73.6	7163	81.8
2004	6133.4	905	80.9	80.6	80.6	79.5	77.2	73.7	7252	82.6
2005	6659.6	905	88.0	81.0	86.5	79.8	84.0	74.2	7882	90.0
2006	4548.8	905	61.4	80.1	60.1	78.9	57.4	73.5	5503	62.8

2007	5965.9	905	77.9	80.0	76.6	78.8	75.3	73.5	7023	80.2
2008	5038.3	905	64.9	79.4	64.2	78.2	63.4	73.1	5852	66.6
2009	6111.5	905	83.8	79.6	77.9	78.2	77.1	73.3	7485	85.4
2010	5735.1	905	74.0	79.3	72.9	78.0	72.3	73.2	6561	74.9
2011	6863.4	905	87.3	79.6	87.2	78.3	86.6	73.7	7733	88.3
2012	6880.9	905	90.0	80.0	87.3	78.7	86.6	74.2	7965	90.7
2013	4538.3	905	64.5	79.5	63.2	78.1	57.2	73.6	5483	62.6
2014	5721.4	905	75.1	79.3	73.8	78.0	72.2	73.6	6565	74.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		700			459	
B. Refuelling without a maintenance				102		
C. Inspection, maintenance or repair combined with refuelling	1404			927	8	
D. Inspection, maintenance or repair without refuelling				2		
E. Testing of plant systems or components				14	1	
H. Nuclear regulatory requirements					16	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			82			39
L. Human factor related					19	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			12		4	11
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					10	1
Z. Other					21	
Subtotal	1404	700	94	1045	538	51
Total		2198			1634	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems	74	18
13. Reactor Auxiliary Systems		33
14. Safety Systems	21	35
15. Reactor Cooling Systems	223	43
16. Steam generation systems		57
17. Safety I&C Systems (excluding reactor I&C)		6
21. Fuel Handling and Storage Facilities	13	22
31. Turbine and auxiliaries	114	55
32. Feedwater and Main Steam System	86	25
33. Circulating Water System		4
35. All other I&C Systems		2
41. Main Generator Systems	42	28
42. Electrical Power Supply Systems	114	47
XX. Miscellaneous Systems	9	61
Total	696	452

## FR-56 CHINON B-3

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 905.0 MW(e)  
 Design Net Capacity: 905.0 MW(e)  
 Design Discharge Burnup: 33735 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6733.2 GW(e)·h  
 Energy Availability Factor: 86.6%  
 Load Factor: 84.9%  
 Operating Factor: 88.0%  
 Energy Unavailability Factor: 13.4%  
 Total Off-line Time: 1049 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	660.6	594.2	664.2	636.2	604.1	620.8	571.1	645.3	488.7	0.0	594.2	653.6	6733.2
EAF (%)	99.4	99.8	99.8	99.4	92.2	97.2	90.0	98.5	75.1	0.0	91.9	97.7	86.6
UCF (%)	99.4	99.8	99.8	99.4	95.9	98.0	90.7	99.3	76.4	1.6	92.0	97.7	87.3
LF (%)	98.1	97.7	98.8	97.6	89.7	95.3	84.8	95.8	75.0	0.0	91.2	97.1	84.9
OF (%)	100.0	100.0	100.0	100.0	93.1	100.0	90.6	100.0	78.2	0.0	97.6	98.8	88.0
EUf (%)	0.6	0.2	0.2	0.6	7.8	2.8	10.0	1.5	24.9	100.0	8.1	2.3	13.4
PUF (%)	0.3	0.1	0.1	0.3	0.1	0.1	0.1	0.1	13.1	84.0	5.3	0.0	8.8
UCLF (%)	0.4	0.1	0.1	0.3	4.1	1.9	9.2	0.7	10.5	14.4	2.7	2.2	3.9
XUF (%)	0.0	0.0	0.0	0.0	3.7	0.8	0.7	0.7	1.3	1.6	0.1	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Oct 1980      Lifetime Generation: 164142.3 GW(e)·h  
 Date of First Criticality: 18 Sep 1986      Cumulative Energy Availability Factor: 78.5%  
 Date of Grid Connection: 20 Oct 1986      Cumulative Load Factor: 73.8%  
 Date of Commercial Operation: 04 Mar 1987      Cumulative Unit Capability Factor: 80.3%  
    Cumulative Energy Unavailability Factor: 21.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	3322.3	870	67.6	67.6	67.6	67.6	52.0	52.0	4383	59.7
1988	4413.0	905	61.5	64.2	58.9	62.8	55.5	53.9	5354	61.0
1989	5028.6	905	81.2	70.3	77.8	68.1	63.4	57.3	6125	69.9
1990	5417.6	905	69.2	70.0	69.1	68.4	68.3	60.2	6274	71.6
1991	7026.4	905	92.9	74.7	90.7	73.0	88.6	66.1	8204	93.7
1992	6091.5	905	87.5	76.9	85.6	75.2	76.6	67.9	7468	85.0
1993	5600.7	905	78.3	77.1	72.6	74.8	70.6	68.3	6827	77.9
1994	5064.0	905	76.2	77.0	75.5	74.9	63.9	67.8	6325	72.2
1995	6005.6	905	83.3	77.7	82.5	75.8	75.8	68.7	7177	81.9
1996	6278.0	905	87.2	78.7	86.9	76.9	79.0	69.7	7761	88.4
1997	5816.8	905	85.1	79.3	85.1	77.7	73.4	70.1	7249	82.8
1998	6345.6	905	84.1	79.7	81.3	78.0	80.0	70.9	7472	85.3
1999	5602.0	905	74.8	79.3	72.2	77.5	70.7	70.9	6656	76.0
2000	6330.1	905	83.1	79.6	82.5	77.9	79.6	71.5	7386	84.1
2001	6318.0	905	87.0	80.1	84.8	78.3	79.7	72.1	7665	87.5
2002	6720.4	905	90.0	80.7	87.6	78.9	84.8	72.9	7971	91.0
2003	5807.7	905	77.7	80.6	77.6	78.8	73.3	72.9	6954	79.4
2004	5784.4	905	82.5	80.7	82.3	79.0	72.8	72.9	7444	84.7
2005	5595.4	905	79.1	80.6	76.5	78.9	70.6	72.8	7287	83.2
2006	6369.7	905	89.0	81.0	86.3	79.3	80.3	73.2	7930	90.5
2007	6061.3	905	80.2	81.0	77.9	79.2	76.5	73.3	7310	83.4
2008	6498.1	905	83.5	81.1	82.3	79.4	81.7	73.7	7760	88.3
2009	3433.5	905	52.1	79.8	43.4	77.8	43.3	72.4	4114	47.0

2010	6488.8	905	82.5	79.9	82.5	78.0	81.8	72.8	7485	85.4
2011	6043.8	905	77.8	79.8	77.6	78.0	76.2	72.9	6906	78.8
2012	6770.5	905	88.4	80.2	85.9	78.3	85.2	73.4	7662	87.2
2013	5930.2	905	76.2	80.0	75.3	78.2	74.8	73.4	6823	77.9
2014	6733.2	905	87.3	80.3	86.6	78.5	84.9	73.8	7711	88.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		270			340	
B. Refuelling without a maintenance	718			71		
C. Inspection, maintenance or repair combined with refuelling				891	26	
D. Inspection, maintenance or repair without refuelling				31		
E. Testing of plant systems or components				28	1	
H. Nuclear regulatory requirements					14	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			8			
L. Human factor related		10			12	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			39		2	32
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					9	
Z. Other					50	
Subtotal	718	280	47	1021	454	32
Total		1045			1507	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		27
12. Reactor I&C Systems		10
13. Reactor Auxiliary Systems	23	40
14. Safety Systems		7
15. Reactor Cooling Systems	37	26
16. Steam generation systems	13	22
21. Fuel Handling and Storage Facilities		25
31. Turbine and auxiliaries	8	71
32. Feedwater and Main Steam System	62	28
33. Circulating Water System		3
35. All other I&C Systems		1
41. Main Generator Systems		33
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems	124	33
Total	267	334

# FR-57 CHINON B-4

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 905.0 MW(e)

Design Net Capacity: 905.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6071.9 GW(e)·h

Energy Availability Factor: 78.9%

Load Factor: 76.6%

Operating Factor: 81.0%

Energy Unavailability Factor: 21.1%

Total Off-line Time: 1668 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	669.4	603.0	669.4	621.2	432.5	0.0	3.9	589.0	612.6	616.4	609.4	645.1	6071.9
EAF (%)	99.7	99.4	99.7	95.3	64.2	0.0	0.6	93.9	99.0	97.2	99.3	99.6	78.9
UCF (%)	99.7	99.4	99.7	99.9	74.3	0.0	0.6	94.6	99.4	99.6	99.3	99.6	80.4
LF (%)	99.4	99.2	99.5	95.3	64.2	0.0	0.6	87.5	94.0	91.4	93.5	95.8	76.6
OF (%)	100.0	100.0	100.0	100.0	74.3	0.0	1.9	96.4	100.0	100.0	100.0	100.0	81.0
EUf (%)	0.3	0.6	0.3	4.7	35.8	100.0	99.4	6.1	1.0	2.8	0.7	0.4	21.1
PUf (%)	0.1	0.2	0.1	0.1	25.7	100.0	99.4	5.1	0.1	0.0	0.1	0.0	19.3
UCLF (%)	0.2	0.5	0.1	0.0	0.0	0.0	0.0	0.3	0.5	0.4	0.6	0.3	0.2
XUF (%)	0.0	0.0	0.0	4.6	10.0	0.0	0.0	0.7	0.4	2.4	0.0	0.0	1.5

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Feb 1981      Lifetime Generation: 159174.3 GW(e)·h

Date of First Criticality: 13 Oct 1987      Cumulative Energy Availability Factor: 79.1%

Date of Grid Connection: 14 Nov 1987      Cumulative Load Factor: 74.6%

Date of Commercial Operation: 01 Apr 1988      Cumulative Unit Capability Factor: 81.2%

Cumulative Energy Unavailability Factor: 20.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	3367.0	905	89.0	89.0	86.2	86.2	56.4	56.4	4475	67.8
1989	4688.1	905	63.6	74.5	60.4	71.5	59.1	57.9	5664	64.7
1990	6098.0	905	77.2	75.5	77.0	73.5	76.9	64.8	7003	79.9
1991	6340.0	905	80.0	76.7	79.2	75.0	80.0	68.9	7204	82.2
1992	6388.0	905	85.0	78.4	82.8	76.7	80.4	71.3	7544	85.9
1993	6016.9	905	85.8	79.7	80.1	77.3	75.9	72.1	7359	84.0
1994	5935.1	905	82.4	80.1	81.2	77.8	74.9	72.5	7196	82.1
1995	6566.0	905	88.2	81.2	87.9	79.1	82.8	73.8	7805	89.1
1996	6574.2	905	87.6	81.9	87.0	80.0	82.7	74.8	7764	88.4
1997	6345.4	905	88.7	82.6	85.6	80.6	80.0	75.4	7795	89.0
1998	5940.1	905	83.1	82.7	80.2	80.6	74.9	75.3	7326	83.6
1999	5596.3	905	89.9	83.3	88.2	81.2	70.6	74.9	7059	80.6
2000	5110.7	905	74.1	82.5	72.9	80.6	64.3	74.1	6445	73.4
2001	5765.0	905	81.3	82.5	79.9	80.5	72.7	74.0	7078	80.8
2002	6321.3	905	85.5	82.7	84.0	80.8	79.7	74.4	7584	86.6
2003	6431.8	905	87.7	83.0	86.6	81.1	81.1	74.8	7811	89.2
2004	5513.2	905	75.1	82.5	74.9	80.8	69.4	74.5	6883	78.4
2005	5356.4	905	71.1	81.9	69.7	80.1	67.6	74.1	7030	80.3
2006	6369.0	905	84.4	82.0	83.3	80.3	80.3	74.4	7558	86.3
2007	6485.7	905	86.1	82.2	84.8	80.5	81.8	74.8	7691	87.8
2008	5863.5	905	77.1	82.0	75.6	80.3	73.8	74.8	6881	78.3
2009	5250.9	905	85.8	82.1	67.4	79.7	66.2	74.4	6232	71.1
2010	4302.6	905	55.0	81.0	54.3	78.6	54.3	73.5	4902	56.0



2011	6790.9	905	86.8	81.2	86.4	78.9	85.7	74.0	7868	89.8
2012	6125.0	905	77.8	81.1	77.5	78.9	77.0	74.1	6958	79.2
2013	6660.9	905	85.7	81.2	84.9	79.1	84.0	74.5	7573	86.4
2014	6071.9	905	80.4	81.2	78.9	79.1	76.6	74.6	7092	81.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					321	
B. Refuelling without a maintenance				75		
C. Inspection, maintenance or repair combined with refuelling	1640			859	14	
E. Testing of plant systems or components				23		
H. Nuclear regulatory requirements					0	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			26			3
L. Human factor related					4	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					6	58
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					9	1
Z. Other					42	17
Subtotal	1640	0	26	957	396	79
Total		1666			1432	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		56
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		32
14. Safety Systems		10
15. Reactor Cooling Systems		45
16. Steam generation systems		9
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		17
31. Turbine and auxiliaries		34
32. Feedwater and Main Steam System		13
33. Circulating Water System		3
35. All other I&C Systems		1
41. Main Generator Systems		33
42. Electrical Power Supply Systems		20
XX. Miscellaneous Systems		22
Total	0	312

## FR-62 CHOOZ B-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1500.0 MW(e)  
 Design Net Capacity: 1455.0 MW(e)  
 Design Discharge Burnup: 39000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8950.5 GW(e)·h  
 Energy Availability Factor: 71.7%  
 Load Factor: 68.1%  
 Operating Factor: 71.7%  
 Energy Unavailability Factor: 28.3%  
 Total Off-line Time: 2481 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	1062.7	1017.9	755.1	0.0	0.0	48.1	953.8	891.3	1028.9	1062.5	1033.1	1097.1	8950.5
EAF (%)	94.7	100.0	67.2	0.0	0.0	4.4	94.3	99.6	99.8	99.9	100.0	100.0	71.7
UCF (%)	100.0	100.0	67.4	0.0	0.0	4.8	94.9	99.8	100.0	100.0	100.0	100.0	72.2
LF (%)	95.2	101.0	67.8	0.0	0.0	4.5	85.5	79.9	95.3	95.1	95.7	98.3	68.1
OF (%)	95.2	100.0	67.7	0.0	0.0	10.1	94.5	92.9	100.0	100.0	100.0	100.0	71.7
EUf (%)	5.3	0.0	32.8	100.0	100.0	95.6	5.7	0.4	0.2	0.1	0.0	0.0	28.3
PUf (%)	0.0	0.0	32.6	100.0	100.0	95.2	1.1	0.1	0.0	0.0	0.0	0.0	27.4
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.1	0.0	0.0	0.0	0.0	0.4
XUF (%)	5.3	0.0	0.1	0.0	0.0	0.4	0.6	0.2	0.2	0.1	0.0	0.0	0.6

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Jan 1984      Lifetime Generation: 160782.2 GW(e)·h  
 Date of First Criticality: 25 Jul 1996      Cumulative Energy Availability Factor: 79.7%  
 Date of Grid Connection: 30 Aug 1996      Cumulative Load Factor: 77.6%  
 Date of Commercial Operation: 15 May 2000      Cumulative Unit Capability Factor: 81.2%  
    Cumulative Energy Unavailability Factor: 20.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2000	8420.9	1455	96.9	96.9	96.9	96.9	98.4	98.4	5711	97.1
2001	9524.4	1455	78.0	85.6	75.0	83.8	74.7	84.2	6800	77.6
2002	9515.1	1455	82.4	84.4	81.0	82.7	74.7	80.7	6807	77.7
2003	10021.9	1500	89.4	85.8	85.6	83.5	76.3	79.4	7219	82.4
2004	10671.1	1500	86.7	86.0	83.6	83.6	81.0	79.8	7657	87.2
2005	9047.7	1500	70.5	83.2	69.6	81.1	68.8	77.8	6285	71.7
2006	9845.7	1500	77.6	82.4	75.6	80.2	74.9	77.4	6885	78.6
2007	10402.3	1500	80.7	82.1	79.6	80.2	79.2	77.6	7154	81.7
2008	12376.7	1500	97.0	83.9	95.0	81.9	93.9	79.5	8572	97.6
2009	8649.5	1500	69.0	82.3	67.5	80.4	65.8	78.1	6307	72.0
2010	8663.0	1500	66.0	80.8	65.9	79.0	65.9	76.9	5962	68.1
2011	10285.7	1500	81.1	80.8	79.7	79.1	78.3	77.1	7044	80.4
2012	12512.9	1500	97.2	82.1	96.5	80.5	95.0	78.5	8496	96.7
2013	10034.8	1500	78.9	81.9	78.2	80.3	76.4	78.3	6905	78.8
2014	8950.5	1500	72.2	81.2	71.7	79.7	68.1	77.6	6279	71.7

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1997 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		27			653	
B. Refuelling without a maintenance				163		
C. Inspection, maintenance or repair	2349			574		

combined with refuelling						
E. Testing of plant systems or components				97		
H. Nuclear regulatory requirements					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			66			6
L. Human factor related					61	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						11
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			45			12
Z. Other					98	
Subtotal	2349	27	111	834	813	29
Total	2487			1676		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1997 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		50
13. Reactor Auxiliary Systems		16
15. Reactor Cooling Systems		49
16. Steam generation systems	27	8
31. Turbine and auxiliaries		405
32. Feedwater and Main Steam System		22
35. All other I&C Systems		1
41. Main Generator Systems		3
42. Electrical Power Supply Systems		54
XX. Miscellaneous Systems		41
Total	27	651

## FR-70 CHOOZ B-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1500.0 MW(e)

Design Net Capacity: 1455.0 MW(e)

Design Discharge Burnup: 39000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 12405.7 GW(e)·h

Energy Availability Factor: 98.0%

Load Factor: 94.4%

Operating Factor: 99.2%

Energy Unavailability Factor: 2.0%

Total Off-line Time: 74 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	1049.4	972.3	1077.7	1030.9	1055.3	1026.4	964.3	1040.9	1043.8	1074.6	1052.7	1017.2	12405.7
EAF (%)	97.1	99.8	99.8	99.2	99.4	99.5	93.6	99.7	99.2	99.5	98.6	91.2	98.0
UCF (%)	97.3	100.0	100.0	99.8	99.9	100.0	100.0	99.9	100.0	100.0	99.8	100.0	99.7
LF (%)	94.0	96.5	96.7	95.5	94.6	95.0	86.4	93.3	96.7	96.2	97.5	91.2	94.4
OF (%)	97.4	100.0	100.0	100.0	100.0	100.0	92.6	100.0	100.0	100.0	100.0	100.0	99.2
EUf (%)	2.9	0.2	0.2	0.8	0.6	0.5	6.4	0.3	0.8	0.5	1.4	8.8	2.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
UCLF (%)	2.7	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.3
XUF (%)	0.2	0.2	0.2	0.6	0.6	0.5	6.3	0.3	0.8	0.5	1.1	8.8	1.7

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 31 Dec 1985      Lifetime Generation: 158470.7 GW(e)·h

Date of First Criticality: 10 Mar 1997      Cumulative Energy Availability Factor: 79.8%

Date of Grid Connection: 10 Apr 1997      Cumulative Load Factor: 77.1%

Date of Commercial Operation: 29 Sep 2000      Cumulative Unit Capability Factor: 84.5%

   Cumulative Energy Unavailability Factor: 20.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2000	3353.3	1455	77.6	77.6	77.6	77.6	78.7	78.7	2473	84.5
2001	10159.5	1455	83.4	82.0	80.4	79.7	79.7	79.5	7221	82.4
2002	9814.8	1455	83.0	82.4	81.5	80.5	77.0	78.4	7240	82.6
2003	10472.8	1500	87.6	84.0	83.3	81.3	79.7	78.8	7457	85.1
2004	10063.9	1500	88.0	85.0	80.1	81.0	76.4	78.2	7061	80.4
2005	10321.5	1500	84.1	84.8	81.6	81.2	78.6	78.3	7343	83.8
2006	9460.5	1500	81.6	84.3	79.6	80.9	72.0	77.3	6845	78.1
2007	11016.5	1500	86.8	84.6	85.2	81.5	83.8	78.2	7725	88.2
2008	11038.9	1500	86.1	84.8	84.6	81.9	83.8	78.9	7639	87.0
2009	7821.9	1500	66.0	82.8	62.5	79.8	59.5	76.8	5593	63.8
2010	10739.8	1500	86.1	83.1	83.4	80.1	81.7	77.3	7529	85.9
2011	11507.7	1500	95.2	84.2	91.2	81.1	87.6	78.2	8076	92.2
2012	5773.7	1500	73.7	83.3	44.0	78.1	43.8	75.4	4092	46.6
2013	10676.7	1500	84.4	83.4	82.4	78.4	81.3	75.8	7351	83.9
2014	12405.7	1500	99.7	84.5	98.0	79.8	94.4	77.1	8686	99.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1997 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		19			682	
B. Refuelling without a maintenance				126		
C. Inspection, maintenance or repair				567		

combined with refuelling						
E. Testing of plant systems or components				82	0	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)		14				49
L. Human factor related					18	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)		47			13	150
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						3
Z. Other					55	
Subtotal	0	19	61	775	768	204
Total	80			1747		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1997 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		17
12. Reactor I&C Systems		63
13. Reactor Auxiliary Systems		37
14. Safety Systems		2
15. Reactor Cooling Systems		8
21. Fuel Handling and Storage Facilities		10
31. Turbine and auxiliaries	19	396
32. Feedwater and Main Steam System		1
33. Circulating Water System		33
41. Main Generator Systems		15
42. Electrical Power Supply Systems		20
XX. Miscellaneous Systems		72
Total	19	674

# FR-72 CIVAUX-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1495.0 MW(e)  
 Design Net Capacity: 1450.0 MW(e)  
 Design Discharge Burnup: 35000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8649.5 GW(e)·h  
 Energy Availability Factor: 66.3%  
 Load Factor: 66.0%  
 Operating Factor: 67.4%  
 Energy Unavailability Factor: 33.7%  
 Total Off-line Time: 2858 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	1110.5	1004.3	1116.7	1002.7	1098.8	1035.0	416.4	0.0	0.0	0.0	765.9	1099.3	8649.5
EAF (%)	99.7	99.8	99.9	93.1	99.4	98.0	37.4	0.0	0.0	0.0	71.1	99.9	66.3
UCF (%)	99.8	99.9	99.9	99.7	99.6	98.7	38.2	0.0	0.0	1.9	75.9	99.9	67.5
LF (%)	99.8	100.0	100.5	93.1	98.8	96.2	37.4	0.0	0.0	0.0	71.2	98.8	66.0
OF (%)	100.0	100.0	100.0	94.0	100.0	100.0	39.0	0.0	0.0	0.0	78.9	100.0	67.4
EUf (%)	0.3	0.2	0.1	6.9	0.6	2.0	62.6	100.0	100.0	100.0	28.9	0.1	33.7
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.1	61.6	100.0	100.0	57.5	20.5	0.1	28.5
UCLF (%)	0.2	0.1	0.1	0.2	0.4	1.1	0.2	0.0	0.0	40.7	3.7	0.0	4.0
XUF (%)	0.0	0.0	0.0	6.6	0.3	0.8	0.8	0.0	0.0	1.9	4.7	0.0	1.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 15 Oct 1988      Lifetime Generation: 141783.0 GW(e)·h  
 Date of First Criticality: 29 Nov 1997      Cumulative Energy Availability Factor: 76.4%  
 Date of Grid Connection: 24 Dec 1997      Cumulative Load Factor: 74.7%  
 Date of Commercial Operation: 29 Jan 2002      Cumulative Unit Capability Factor: 78.3%  
 Cumulative Energy Unavailability Factor: 23.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2002	9544.1	1495	81.5	81.5	80.4	80.4	72.9	72.9	7331	83.7
2003	10932.1	1495	84.1	82.8	83.1	81.7	83.5	78.2	7438	84.9
2004	11276.5	1495	88.0	84.6	86.9	83.5	85.9	80.7	7816	89.0
2005	9672.3	1495	76.3	82.5	73.8	81.0	73.8	79.0	6855	78.2
2006	10318.2	1495	80.9	82.2	79.3	80.7	78.8	79.0	7189	82.1
2007	9031.5	1495	69.6	80.1	69.4	78.8	69.0	77.3	6242	71.2
2008	9873.0	1495	77.0	79.6	76.0	78.4	75.2	77.0	6967	79.3
2009	9494.4	1495	76.5	79.3	73.4	77.8	72.5	76.4	6852	78.2
2010	10590.1	1495	82.0	79.6	81.5	78.2	80.9	76.9	7582	86.6
2011	8663.9	1495	67.9	78.4	67.2	77.1	66.2	75.9	6006	68.6
2012	11583.2	1495	97.1	80.1	96.4	78.9	88.2	77.0	8487	96.6
2013	7637.3	1495	68.9	79.2	58.9	77.2	58.3	75.4	5425	61.9
2014	8649.5	1495	67.5	78.3	66.3	76.4	66.0	74.7	5902	67.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2002 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		324			344	
B. Refuelling without a maintenance	2345			354		
C. Inspection, maintenance or repair combined with refuelling				632		
E. Testing of plant systems or components	96			19		

H. Nuclear regulatory requirements					4	
L. Human factor related					23	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			48			9
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			47			73
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						1
Z. Other					75	
Subtotal	2441	324	95	1005	446	83
Total	2860			1534		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2002 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	241	1
12. Reactor I&C Systems		31
13. Reactor Auxiliary Systems		4
14. Safety Systems	45	20
15. Reactor Cooling Systems		25
16. Steam generation systems		0
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		8
33. Circulating Water System		9
35. All other I&C Systems		18
41. Main Generator Systems		26
42. Electrical Power Supply Systems		154
XX. Miscellaneous Systems	37	27
Total	323	337

## FR-73 CIVAUX-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1495.0 MW(e)

Design Net Capacity: 1450.0 MW(e)

Design Discharge Burnup: 35000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 10918.2 GW(e)·h

Energy Availability Factor: 95.4%

Load Factor: 83.4%

Operating Factor: 92.4%

Energy Unavailability Factor: 4.6%

Total Off-line Time: 669 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	737.7	921.1	1037.5	1041.2	789.3	747.4	852.3	816.3	945.2	1062.2	879.9	1088.0	10918.2
EAF (%)	69.8	96.4	95.1	99.7	88.1	99.3	99.2	99.5	99.1	99.5	99.7	99.9	95.4
UCF (%)	69.8	96.8	95.2	99.8	88.2	99.7	99.8	99.9	99.6	99.9	99.7	99.9	95.6
LF (%)	66.3	91.7	93.4	96.7	71.0	69.4	76.6	73.4	87.8	95.4	81.7	97.8	83.4
OF (%)	74.9	97.2	95.7	100.0	74.5	78.8	96.6	96.5	100.0	100.0	94.9	100.0	92.4
EUf (%)	30.2	3.6	4.9	0.3	11.9	0.7	0.8	0.5	0.9	0.5	0.3	0.1	4.6
PUf (%)	4.7	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
UCLF (%)	25.5	3.2	4.7	0.2	11.8	0.3	0.2	0.1	0.4	0.2	0.3	0.1	4.0
XUF (%)	0.0	0.4	0.0	0.1	0.1	0.3	0.6	0.3	0.5	0.3	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Apr 1991      Lifetime Generation: 143485.9 GW(e)·h

Date of First Criticality: 27 Nov 1999      Cumulative Energy Availability Factor: 80.6%

Date of Grid Connection: 24 Dec 1999      Cumulative Load Factor: 76.7%

Date of Commercial Operation: 23 Apr 2002      Cumulative Unit Capability Factor: 85.0%

Cumulative Energy Unavailability Factor: 19.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2002	7199.1	1495	94.8	94.8	92.2	92.2	73.0	73.0	5751	87.1
2003	9084.8	1495	70.5	80.9	70.4	79.8	69.4	70.9	6542	74.7
2004	11698.6	1495	90.0	84.2	89.6	83.4	89.1	77.5	8042	91.6
2005	9621.4	1495	75.9	82.0	73.5	80.7	73.5	76.4	6748	77.0
2006	11140.1	1495	91.6	84.0	89.8	82.6	85.1	78.3	7811	89.2
2007	9973.8	1495	82.3	83.7	80.2	82.2	76.1	77.9	7141	81.5
2008	11321.5	1495	91.1	84.8	89.0	83.2	86.2	79.1	8085	92.0
2009	10293.3	1495	82.8	84.5	80.1	82.8	78.6	79.1	7219	82.4
2010	11094.0	1495	88.5	85.0	86.1	83.2	84.7	79.7	7743	88.4
2011	10640.6	1495	91.4	85.7	86.6	83.5	81.2	79.9	7717	88.1
2012	4561.7	1495	69.6	84.2	35.3	79.0	34.7	75.7	3228	36.7
2013	10581.6	1495	83.8	84.1	82.7	79.4	80.8	76.1	7344	83.8
2014	10918.2	1495	95.6	85.0	95.4	80.6	83.4	76.7	8091	92.4

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2002 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		325			202	
B. Refuelling without a maintenance				236		
C. Inspection, maintenance or repair combined with refuelling				644		
E. Testing of plant systems or components				26		



H. Nuclear regulatory requirements					2	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			368			11
L. Human factor related					16	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						244
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						28
Z. Other					19	
Subtotal	0	325	368	906	239	283
Total	693			1428		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2002 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	19	26
12. Reactor I&C Systems	44	2
13. Reactor Auxiliary Systems	12	25
14. Safety Systems	49	11
15. Reactor Cooling Systems	27	21
16. Steam generation systems	32	
21. Fuel Handling and Storage Facilities		22
31. Turbine and auxiliaries	19	13
32. Feedwater and Main Steam System	85	4
41. Main Generator Systems		1
42. Electrical Power Supply Systems		54
XX. Miscellaneous Systems	36	18
Total	323	197

# FR-42 CRUAS-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 915.0 MW(e)

Design Net Capacity: 880.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6767.4 GW(e)·h

Energy Availability Factor: 86.3%

Load Factor: 84.4%

Operating Factor: 88.1%

Energy Unavailability Factor: 13.7%

Total Off-line Time: 1040 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	676.1	590.8	672.4	646.2	658.7	0.0	428.4	630.6	625.2	537.9	635.7	665.4	6767.4
EAF (%)	99.8	97.1	99.9	99.8	98.9	0.0	65.4	99.9	98.7	80.2	98.0	97.9	86.3
UCF (%)	99.8	99.7	99.9	99.8	98.9	0.0	65.4	99.9	99.9	84.7	99.9	99.9	87.3
LF (%)	99.3	96.1	98.9	98.1	96.8	0.0	62.9	92.6	94.9	78.9	96.5	97.7	84.4
OF (%)	100.0	100.0	100.0	100.0	99.2	0.0	74.7	100.0	100.0	83.1	100.0	100.0	88.1
EUf (%)	0.2	2.9	0.1	0.2	1.1	100.0	34.6	0.1	1.3	19.8	2.0	2.1	13.7
PUf (%)	0.1	0.2	0.1	0.2	1.1	100.0	16.4	0.1	0.1	1.9	0.1	0.1	10.0
UCLF (%)	0.1	0.1	0.0	0.0	0.0	0.0	18.2	0.0	0.0	13.3	0.0	0.0	2.7
XUF (%)	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	1.2	4.5	1.9	1.9	1.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Aug 1978      Lifetime Generation: 177010.4 GW(e)·h

Date of First Criticality: 02 Apr 1983      Cumulative Energy Availability Factor: 78.7%

Date of Grid Connection: 29 Apr 1983      Cumulative Load Factor: 72.3%

Date of Commercial Operation: 02 Apr 1984      Cumulative Unit Capability Factor: 81.0%

Cumulative Energy Unavailability Factor: 21.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	4800.0	880	82.6	82.6	82.6	82.6	82.6	82.6	6130	92.9
1985	5185.2	880	77.2	79.5	72.0	76.5	67.3	73.9	6615	75.5
1986	5888.0	880	87.6	82.5	86.0	80.0	76.4	74.8	7377	84.2
1987	5359.5	880	83.7	82.8	81.8	80.5	69.5	73.4	6860	78.3
1988	4025.0	880	98.0	86.0	96.7	83.9	52.1	68.9	5562	63.3
1989	5648.9	880	86.1	86.0	83.6	83.9	73.3	69.7	7239	82.6
1990	4983.5	880	84.8	85.8	82.6	83.7	64.6	68.9	6809	77.7
1991	4477.8	880	68.2	83.6	65.3	81.3	58.1	67.5	5762	65.8
1992	5739.4	880	81.0	83.3	77.8	80.9	74.2	68.3	7183	81.8
1993	6156.6	880	87.2	83.7	84.6	81.3	79.9	69.5	7353	83.9
1994	6181.2	915	84.5	83.7	84.3	81.6	77.1	70.2	7498	85.6
1995	4630.4	915	63.3	81.9	62.5	79.9	57.8	69.1	5624	64.2
1996	6258.5	915	83.9	82.1	83.0	80.1	77.9	69.8	7478	85.1
1997	5271.2	915	77.9	81.8	74.1	79.7	65.8	69.5	6784	77.4
1998	6387.3	915	90.8	82.4	89.5	80.4	79.7	70.2	7864	89.8
1999	5890.7	915	85.5	82.6	83.8	80.6	73.5	70.4	7367	84.1
2000	6320.5	915	87.6	82.9	86.0	80.9	78.6	70.9	7742	88.1
2001	5918.3	915	81.7	82.8	81.1	80.9	73.8	71.1	7264	82.9
2002	6069.8	915	80.6	82.7	80.5	80.9	75.7	71.4	7349	83.9
2003	6120.5	915	82.5	82.7	81.1	80.9	76.4	71.6	7403	84.5
2004	5866.1	915	77.0	82.4	76.1	80.7	73.0	71.7	6907	78.6
2005	5345.4	915	71.1	81.9	70.6	80.2	66.7	71.5	6311	72.0
2006	6491.0	915	84.8	82.0	83.7	80.4	81.0	71.9	7716	88.1

2007	4468.5	915	58.4	81.0	55.9	79.3	55.7	71.2	5506	62.9
2008	6281.4	915	80.8	81.0	79.3	79.3	78.2	71.5	7285	82.9
2009	5066.6	915	78.8	80.9	63.4	78.7	63.2	71.1	6016	68.7
2010	6529.5	915	83.2	81.0	82.2	78.8	81.5	71.5	7413	84.6
2011	5791.8	915	73.0	80.7	72.8	78.6	72.3	71.6	6573	75.0
2012	5896.7	915	80.9	80.7	73.5	78.4	73.4	71.6	6640	75.6
2013	6325.1	915	82.3	80.8	79.9	78.5	78.9	71.9	7087	80.9
2014	6767.4	915	87.3	81.0	86.3	78.7	84.4	72.3	7720	88.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		222			391	
B. Refuelling without a maintenance	779			88		
C. Inspection, maintenance or repair combined with refuelling				845	16	
D. Inspection, maintenance or repair without refuelling				20		
E. Testing of plant systems or components	12			15		
H. Nuclear regulatory requirements					4	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						9
L. Human factor related					68	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			23		15	68
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						0
Z. Other				1	43	
Subtotal	791	222	23	969	537	78
Total		1036			1584	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		17
12. Reactor I&C Systems	1	16
13. Reactor Auxiliary Systems		15
14. Safety Systems	22	28
15. Reactor Cooling Systems	24	17
16. Steam generation systems		8
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries	26	34
32. Feedwater and Main Steam System		8
33. Circulating Water System		2
35. All other I&C Systems	67	0
41. Main Generator Systems	48	194
42. Electrical Power Supply Systems	8	6
XX. Miscellaneous Systems	23	38
Total	219	385

## FR-43 CRUAS-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 915.0 MW(e)

Design Net Capacity: 915.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6708.4 GW(e)·h

Energy Availability Factor: 86.2%

Load Factor: 83.7%

Operating Factor: 90.5%

Energy Unavailability Factor: 13.8%

Total Off-line Time: 829 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	656.0	583.9	643.8	571.3	603.5	606.3	634.7	637.7	618.8	630.5	522.0	0.0	6708.4
EAF (%)	98.9	98.6	99.9	93.1	94.4	95.6	93.7	94.4	94.1	93.6	79.2	0.0	86.2
UCF (%)	98.9	98.6	99.9	93.1	94.4	99.9	99.7	99.9	99.7	99.9	93.1	0.0	89.6
LF (%)	96.4	95.0	94.7	86.7	88.6	92.0	93.2	93.7	93.9	92.5	79.2	0.0	83.7
OF (%)	100.0	100.0	100.0	94.7	100.0	100.0	100.0	100.0	100.0	100.0	93.5	0.0	90.5
EUf (%)	1.1	1.4	0.1	6.9	5.6	4.4	6.3	5.6	5.9	6.4	20.8	100.0	13.8
PUF (%)	1.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.1	6.9	93.6	8.7
UCLF (%)	0.0	1.3	0.0	6.5	5.6	0.0	0.2	0.0	0.2	0.0	0.0	6.4	1.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	4.3	6.0	5.5	5.6	6.3	13.9	0.0	3.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

BASE LOAD

### 5. Historical Summary

Date of Construction Start: 15 Nov 1978      Lifetime Generation: 175734.5 GW(e)·h

Date of First Criticality: 01 Aug 1984      Cumulative Energy Availability Factor: 78.1%

Date of Grid Connection: 06 Sep 1984      Cumulative Load Factor: 73.3%

Date of Commercial Operation: 01 Apr 1985      Cumulative Unit Capability Factor: 80.6%

Cumulative Energy Unavailability Factor: 21.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	4844.4	880	98.3	98.3	96.0	96.0	83.4	83.4	6425	97.3
1986	4955.0	880	70.4	82.4	70.1	81.2	64.3	72.5	6258	71.4
1987	5559.9	900	79.8	81.4	79.1	80.4	70.5	71.8	6761	77.2
1988	5698.0	915	85.0	82.4	80.6	80.5	70.9	71.5	7176	81.7
1989	6298.5	915	86.2	83.2	83.3	81.1	78.6	73.0	7697	87.9
1990	6001.8	915	79.8	82.6	77.7	80.5	74.9	73.4	7114	81.2
1991	4099.9	915	55.3	78.5	53.7	76.5	51.2	70.0	4838	55.2
1992	5946.9	915	77.0	78.3	77.0	76.5	74.0	70.6	6910	78.7
1993	5441.0	915	78.1	78.3	73.5	76.2	67.9	70.2	6463	73.8
1994	5566.1	915	96.8	80.2	94.1	78.0	69.4	70.2	6765	77.2
1995	5366.8	915	76.3	79.8	72.4	77.5	67.0	69.9	6581	75.1
1996	6521.9	915	88.8	80.6	87.1	78.3	81.1	70.8	7870	89.6
1997	5176.1	915	80.9	80.6	76.5	78.2	64.6	70.3	6596	75.3
1998	6003.6	915	82.8	80.8	79.0	78.3	74.9	70.7	7396	84.4
1999	6393.8	915	88.1	81.3	85.3	78.7	79.8	71.3	7787	88.9
2000	6420.9	915	87.0	81.7	85.6	79.2	79.9	71.8	7755	88.3
2001	5914.4	915	79.7	81.5	76.5	79.0	73.8	72.0	7053	80.5
2002	6547.4	915	86.5	81.8	86.0	79.4	81.7	72.5	7776	88.8
2003	5727.9	915	75.8	81.5	75.6	79.2	71.5	72.5	6927	79.1
2004	6613.0	915	86.0	81.7	84.9	79.5	82.3	73.0	7661	87.2
2005	6504.1	915	85.8	81.9	83.0	79.7	81.1	73.3	7684	87.7
2006	6509.5	915	85.6	82.1	84.3	79.9	81.2	73.7	7736	88.3
2007	4617.9	915	61.6	81.2	58.0	78.9	57.6	73.0	5602	63.9

2008	5597.4	915	70.9	80.8	69.8	78.5	69.6	72.9	6633	75.5
2009	5862.2	915	78.7	80.7	73.6	78.3	73.1	72.9	6886	78.6
2010	5305.4	915	74.5	80.4	66.6	77.9	66.2	72.6	6036	68.9
2011	5791.2	915	74.1	80.2	73.0	77.7	72.3	72.6	6577	75.1
2012	6761.6	915	86.5	80.4	84.7	77.9	84.1	73.0	7665	87.3
2013	5729.4	915	75.7	80.3	73.0	77.8	71.5	73.0	6729	76.8
2014	6708.4	915	89.6	80.6	86.2	78.1	83.7	73.3	7931	90.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		85			340	
B. Refuelling without a maintenance	743			58		
C. Inspection, maintenance or repair combined with refuelling				872	7	
E. Testing of plant systems or components				7	0	
H. Nuclear regulatory requirements					5	
L. Human factor related					51	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						17
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					9	33
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					3	
Z. Other					48	
Subtotal	743	85	0	937	463	50
Total		828			1450	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		27
12. Reactor I&C Systems	1	11
13. Reactor Auxiliary Systems	46	6
14. Safety Systems		8
15. Reactor Cooling Systems		7
16. Steam generation systems		21
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	38	94
32. Feedwater and Main Steam System		17
33. Circulating Water System		1
35. All other I&C Systems		1
41. Main Generator Systems		121
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		17
Total	85	333

# FR-44 CRUAS-3

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 915.0 MW(e)

Design Net Capacity: 880.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4529.7 GW(e)·h

Energy Availability Factor: 57.1%

Load Factor: 56.5%

Operating Factor: 58.8%

Energy Unavailability Factor: 42.9%

Total Off-line Time: 3612 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	676.4	612.1	673.7	645.5	660.2	637.5	381.1	0.0	0.0	0.0	0.0	243.2	4529.7
EAF (%)	99.9	99.9	99.9	99.8	99.9	97.4	56.0	0.0	0.0	0.0	0.0	35.8	57.1
UCF (%)	99.9	99.9	100.0	99.8	99.9	99.9	58.1	0.0	0.0	3.2	7.2	35.8	58.4
LF (%)	99.4	99.5	99.1	98.0	97.0	96.8	56.0	0.0	0.0	0.0	0.0	35.7	56.5
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	58.5	0.0	0.0	0.0	0.0	49.7	58.8
EUf (%)	0.1	0.1	0.1	0.2	0.1	2.6	44.0	100.0	100.0	100.0	100.0	64.2	42.9
PUf (%)	0.1	0.1	0.1	0.2	0.1	0.1	42.0	100.0	100.0	96.8	0.0	12.5	29.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	92.9	51.7	12.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	2.6	2.1	0.0	0.0	3.2	7.2	0.0	1.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 15 Apr 1979      Lifetime Generation: 175216.7 GW(e)·h

Date of First Criticality: 09 Apr 1984      Cumulative Energy Availability Factor: 78.7%

Date of Grid Connection: 14 May 1984      Cumulative Load Factor: 72.2%

Date of Commercial Operation: 10 Sep 1984      Cumulative Unit Capability Factor: 81.7%

Cumulative Energy Unavailability Factor: 21.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	2311.0	880	91.9	91.9	91.9	91.9	89.7	89.7	2716	92.7
1985	5247.4	880	74.6	78.9	72.5	77.4	68.1	73.5	6557	74.9
1986	5967.1	880	89.5	83.5	89.2	82.5	77.4	75.2	7456	85.1
1987	4721.4	880	75.7	81.1	75.1	80.3	61.2	71.0	6013	68.6
1988	4773.0	880	99.9	85.5	98.6	84.5	61.7	68.9	6679	76.0
1989	5577.9	880	74.2	83.4	72.8	82.3	72.4	69.5	6571	75.0
1990	6129.2	915	87.5	84.0	85.2	82.8	76.5	70.6	7499	85.6
1991	6003.2	915	85.2	84.2	84.7	83.1	74.9	71.2	7374	84.2
1992	5174.6	915	73.2	82.8	71.0	81.6	64.4	70.4	6323	72.0
1993	5715.3	915	85.7	83.1	73.9	80.7	71.3	70.5	7232	82.6
1994	5014.0	915	78.9	82.7	78.1	80.5	62.6	69.7	6428	73.4
1995	6032.7	915	89.6	83.3	84.3	80.8	75.3	70.2	7525	85.9
1996	5882.2	915	99.7	84.7	91.9	81.7	73.2	70.5	7724	87.9
1997	5347.8	915	86.1	84.8	80.2	81.6	66.7	70.2	6961	79.5
1998	6281.4	915	81.7	84.6	78.7	81.4	78.4	70.8	7758	88.6
1999	6316.7	915	89.8	84.9	87.8	81.8	78.8	71.3	7654	87.4
2000	5494.0	915	81.4	84.7	79.0	81.7	68.4	71.1	6914	78.7
2001	5867.9	915	82.1	84.5	79.6	81.5	73.2	71.2	7254	82.8
2002	6052.0	915	82.1	84.4	80.9	81.5	75.5	71.5	7307	83.4
2003	5779.4	915	79.2	84.1	76.8	81.3	72.1	71.5	7146	81.6
2004	5081.3	915	65.9	83.2	64.1	80.4	63.2	71.1	6074	69.1
2005	6941.6	915	88.3	83.5	87.8	80.7	86.6	71.8	7863	89.8
2006	6487.5	915	83.5	83.5	83.1	80.9	80.9	72.2	7520	85.8

2007	5435.8	915	71.4	83.0	68.1	80.3	67.8	72.0	6456	73.7
2008	4858.6	915	61.0	82.0	60.9	79.5	60.4	71.6	5750	65.5
2009	6366.0	915	84.3	82.1	79.9	79.5	79.4	71.9	7392	84.4
2010	6277.8	915	79.6	82.0	78.3	79.5	78.3	72.1	7004	80.0
2011	6741.6	915	85.7	82.2	85.0	79.7	84.1	72.6	7580	86.5
2012	5106.7	915	83.0	82.2	64.5	79.1	63.5	72.2	5899	67.2
2013	6866.8	915	89.9	82.5	88.2	79.4	85.7	72.7	7750	88.5
2014	4529.7	915	58.4	81.7	57.1	78.7	56.5	72.2	5148	58.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1041			181	
B. Refuelling without a maintenance				79		
C. Inspection, maintenance or repair combined with refuelling	2493			853	27	
D. Inspection, maintenance or repair without refuelling					4	
E. Testing of plant systems or components	0			7		
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						1
L. Human factor related					78	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			75			55
Z. Other					62	15
Subtotal	2493	1041	75	939	352	77
Total		3609			1368	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	216	
12. Reactor I&C Systems	44	12
13. Reactor Auxiliary Systems	165	4
14. Safety Systems	96	8
15. Reactor Cooling Systems		44
16. Steam generation systems		21
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	20	41
32. Feedwater and Main Steam System		11
35. All other I&C Systems	72	
41. Main Generator Systems		2
42. Electrical Power Supply Systems	48	19
XX. Miscellaneous Systems	380	15
Total	1041	178

## FR-45 CRUAS-4

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 915.0 MW(e)  
 Design Net Capacity: 880.0 MW(e)  
 Design Discharge Burnup: 33735 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 4677.9 GW(e)·h  
 Energy Availability Factor: 58.4%  
 Load Factor: 58.4%  
 Operating Factor: 64.1%  
 Energy Unavailability Factor: 41.6%  
 Total Off-line Time: 3149 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	671.1	621.4	152.0	0.0	0.0	0.0	79.2	540.7	645.8	631.8	657.4	678.5	4677.9
EAF (%)	97.6	99.9	22.2	0.0	0.0	0.0	11.6	79.5	99.6	93.6	99.9	99.8	58.4
UCF (%)	97.6	99.9	22.3	0.0	0.0	23.3	11.7	79.5	99.7	94.9	99.9	99.8	60.5
LF (%)	98.6	101.1	22.4	0.0	0.0	0.0	11.6	79.4	98.0	92.7	99.8	99.7	58.4
OF (%)	100.0	100.0	23.1	0.0	0.0	0.0	47.0	100.0	100.0	100.0	100.0	100.0	64.1
EUf (%)	2.4	0.1	77.8	100.0	100.0	100.0	88.4	20.5	0.4	6.4	0.1	0.2	41.6
PUf (%)	0.1	0.1	77.7	100.0	100.0	64.2	26.5	14.8	0.2	0.9	0.1	0.2	32.2
UCLF (%)	2.3	0.0	0.0	0.0	0.0	12.4	61.8	5.8	0.1	4.2	0.0	0.0	7.3
XUF (%)	0.0	0.0	0.1	0.0	0.0	23.3	0.0	0.0	0.1	1.4	0.0	0.0	2.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 171107.3 GW(e)·h  
 Date of First Criticality: 01 Oct 1984      Cumulative Energy Availability Factor: 76.8%  
 Date of Grid Connection: 27 Oct 1984      Cumulative Load Factor: 71.6%  
 Date of Commercial Operation: 11 Feb 1985      Cumulative Unit Capability Factor: 79.2%  
    Cumulative Energy Unavailability Factor: 23.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	5187.0	880	87.1	87.1	85.7	85.7	73.5	73.5	6759	84.3
1986	5452.6	880	80.3	83.6	76.7	81.0	70.7	72.1	6816	77.8
1987	5313.4	880	85.1	84.1	84.2	82.1	68.9	71.0	6888	78.6
1988	3247.0	880	76.0	82.0	74.2	80.1	42.0	63.6	4271	48.6
1989	4852.2	880	71.4	79.9	71.3	78.3	62.9	63.4	6025	68.8
1990	6215.3	880	86.4	81.0	86.0	79.6	80.6	66.3	7607	86.8
1991	6005.4	880	83.9	81.4	81.1	79.8	77.9	68.0	7259	82.9
1992	4953.6	880	66.0	79.5	65.0	77.9	64.1	67.5	5862	66.7
1993	5280.0	880	84.9	80.1	77.1	77.8	68.5	67.6	6653	75.9
1994	5552.1	915	86.8	80.8	83.8	78.5	69.3	67.8	6856	78.3
1995	6280.3	915	86.0	81.3	82.1	78.8	78.4	68.8	7375	84.2
1996	5886.5	915	80.7	81.2	79.4	78.9	73.2	69.2	7180	81.7
1997	5976.6	915	84.1	81.4	80.2	79.0	74.6	69.6	7334	83.7
1998	6629.2	915	88.7	82.0	85.5	79.5	82.7	70.6	7885	90.0
1999	5829.8	915	85.4	82.2	81.9	79.6	72.7	70.7	7159	81.7
2000	6630.7	915	89.7	82.7	88.4	80.2	82.5	71.5	7915	90.1
2001	5915.8	915	83.3	82.7	80.6	80.2	73.8	71.6	7172	81.9
2002	6399.6	915	83.4	82.8	82.9	80.4	79.8	72.1	7474	85.3
2003	6296.7	915	82.9	82.8	81.6	80.4	78.6	72.4	7371	84.1
2004	6377.4	915	83.4	82.8	80.6	80.4	79.3	72.8	7443	84.7
2005	6255.1	915	81.6	82.7	79.6	80.4	78.0	73.0	7360	84.0
2006	3752.7	915	47.6	81.1	47.6	78.9	46.8	71.8	4259	48.6
2007	4947.3	915	62.0	80.3	61.7	78.1	61.7	71.4	5839	66.7



2008	6228.8	915	78.5	80.2	77.4	78.1	77.5	71.6	7011	79.8
2009	6321.8	915	86.1	80.4	79.5	78.2	78.9	71.9	7347	83.9
2010	5107.0	915	67.5	79.9	63.8	77.6	63.7	71.6	5779	66.0
2011	7152.5	915	89.7	80.3	89.2	78.0	89.2	72.3	7938	90.6
2012	4305.9	915	61.7	79.6	53.3	77.1	53.6	71.6	4853	55.2
2013	6916.2	915	86.6	79.9	86.1	77.4	86.3	72.1	7727	88.2
2014	4677.9	915	60.5	79.2	58.4	76.8	58.4	71.6	5611	64.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		483			398	
B. Refuelling without a maintenance				112		
C. Inspection, maintenance or repair combined with refuelling	2498			732	44	
D. Inspection, maintenance or repair without refuelling				7		
E. Testing of plant systems or components				10	2	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				85		
H. Nuclear regulatory requirements					2	
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					19	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			120			4
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			48			74
Z. Other					27	
Subtotal	2498	483	168	946	492	78
Total		3149			1516	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems	106	6
13. Reactor Auxiliary Systems		17
14. Safety Systems		4
15. Reactor Cooling Systems		32
16. Steam generation systems		106
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries	145	77
32. Feedwater and Main Steam System		13
41. Main Generator Systems		28
42. Electrical Power Supply Systems		16
XX. Miscellaneous Systems	231	86
Total	482	392

# FR-22 DAMPIERRE-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 890.0 MW(e)

Design Net Capacity: 890.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6775.7 GW(e)·h

Energy Availability Factor: 87.7%

Load Factor: 86.9%

Operating Factor: 90.5%

Energy Unavailability Factor: 12.3%

Total Off-line Time: 833 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	644.1	577.6	652.1	625.7	635.1	621.8	638.0	602.6	215.0	266.3	637.3	660.0	6775.7
EAF (%)	99.5	99.6	99.6	98.5	98.4	97.1	96.4	91.0	33.6	40.1	99.5	99.7	87.7
UCF (%)	99.5	99.7	99.6	98.8	98.4	98.5	98.8	100.0	40.0	40.1	99.6	99.7	89.3
LF (%)	97.3	96.6	98.6	97.6	95.9	97.0	96.4	91.0	33.6	40.2	99.5	99.7	86.9
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	40.1	46.0	100.0	100.0	90.5
EUf (%)	0.5	0.4	0.4	1.5	1.6	2.9	3.6	9.0	66.4	59.9	0.5	0.3	12.3
PUF (%)	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	60.0	44.7	0.4	0.0	8.8
UCLF (%)	0.4	0.3	0.4	1.2	1.6	1.6	1.1	0.0	0.0	15.2	0.1	0.3	1.9
XUF (%)	0.0	0.0	0.1	0.2	0.0	1.3	2.5	9.0	6.4	0.0	0.0	0.0	1.6

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Feb 1975      Lifetime Generation: 193825.1 GW(e)·h

Date of First Criticality: 15 Mar 1980      Cumulative Energy Availability Factor: 76.4%

Date of Grid Connection: 23 Mar 1980      Cumulative Load Factor: 72.0%

Date of Commercial Operation: 10 Sep 1980      Cumulative Unit Capability Factor: 77.6%

Cumulative Energy Unavailability Factor: 23.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	1822.0	898	61.9	61.9	61.9	61.9	69.1	69.1	2141	73.1
1981	4322.1	900	55.9	57.4	55.9	57.4	54.8	58.4	5270	60.2
1982	5043.9	890	65.6	60.9	65.6	60.9	64.7	61.1	5994	68.4
1983	6263.0	890	85.9	68.3	85.9	68.3	80.3	66.8	7847	89.6
1984	5391.0	890	73.6	69.6	73.6	69.6	69.0	67.3	6777	77.2
1985	5738.5	890	80.9	71.7	80.6	71.6	73.6	68.5	7223	82.5
1986	5157.4	890	75.9	72.3	75.7	72.3	66.2	68.1	6673	76.2
1987	4780.2	890	67.9	71.7	65.9	71.4	61.3	67.2	6245	71.3
1988	3920.0	890	61.2	70.5	59.6	70.0	50.1	65.2	5239	59.6
1989	6467.6	890	98.6	73.5	97.9	73.0	83.0	67.1	8207	93.7
1990	2187.1	890	36.3	69.9	34.0	69.2	28.1	63.3	3110	35.5
1991	6390.9	890	82.2	71.0	81.8	70.3	82.0	64.9	7305	83.4
1992	6305.1	890	81.7	71.9	80.7	71.2	80.7	66.2	7293	83.0
1993	6702.8	890	86.6	73.0	86.4	72.3	86.0	67.7	7676	87.6
1994	5299.2	890	69.7	72.7	68.9	72.1	68.0	67.7	6185	70.6
1995	6194.0	890	84.4	73.5	82.9	72.8	79.4	68.5	7413	84.6
1996	5895.5	890	83.1	74.1	82.2	73.3	75.4	68.9	7378	84.0
1997	5172.1	890	72.3	74.0	71.9	73.3	66.3	68.8	6465	73.8
1998	6042.7	890	81.9	74.4	80.5	73.7	77.5	69.2	7294	83.3
1999	5492.4	890	76.8	74.5	75.3	73.7	70.4	69.3	6815	77.8
2000	6153.8	890	87.0	75.1	85.4	74.3	78.7	69.8	7676	87.4
2001	4125.1	890	56.8	74.3	56.7	73.5	52.9	69.0	5152	58.8
2002	6249.6	890	87.6	74.9	86.8	74.1	80.2	69.5	7586	86.6

2003	5733.3	890	78.3	75.0	76.8	74.2	73.5	69.6	6964	79.5
2004	6091.2	890	89.7	75.6	89.3	74.8	77.9	70.0	7840	89.3
2005	5838.8	890	85.2	76.0	82.8	75.1	74.9	70.2	7554	86.2
2006	6615.1	890	91.2	76.6	88.6	75.7	84.8	70.7	8077	92.2
2007	6050.0	890	82.6	76.8	80.7	75.8	77.6	71.0	7329	83.7
2008	6545.3	890	90.7	77.3	89.7	76.3	83.7	71.4	8051	91.7
2009	4973.2	890	77.6	77.3	66.7	76.0	63.8	71.2	6048	69.0
2010	6357.0	890	84.8	77.5	83.9	76.3	81.5	71.5	7511	85.7
2011	5426.1	890	71.2	77.3	70.7	76.1	69.6	71.5	6373	72.8
2012	6464.5	890	86.1	77.6	84.5	76.3	82.7	71.8	7623	86.8
2013	5072.1	890	66.3	77.3	65.9	76.0	65.1	71.6	5882	67.1
2014	6775.7	890	89.3	77.6	87.7	76.4	86.9	72.0	7927	90.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		113			313	
B. Refuelling without a maintenance	720			111		
C. Inspection, maintenance or repair combined with refuelling				1000	30	
D. Inspection, maintenance or repair without refuelling				53	0	
E. Testing of plant systems or components				2	1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					29	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						59
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					6	1
Z. Other					155	
Subtotal	720	113	0	1166	534	60
Total		833			1760	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		32
13. Reactor Auxiliary Systems		14
14. Safety Systems		9
15. Reactor Cooling Systems		37
16. Steam generation systems		43
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		25
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems		50
42. Electrical Power Supply Systems		7
XX. Miscellaneous Systems	113	63
Total	113	307

## FR-29 DAMPIERRE-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 890.0 MW(e)

Design Net Capacity: 890.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5771.7 GW(e)·h

Energy Availability Factor: 77.8%

Load Factor: 74.0%

Operating Factor: 78.9%

Energy Unavailability Factor: 22.2%

Total Off-line Time: 1847 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	669.5	151.2	0.0	117.5	647.1	580.6	602.2	583.5	610.0	583.4	558.9	667.8	5771.7
EAF (%)	100.0	24.9	0.0	18.3	99.1	94.5	99.3	99.6	97.4	95.6	99.8	99.9	77.8
UCF (%)	100.0	24.9	0.0	20.5	99.6	95.2	100.0	99.8	98.3	97.3	99.9	99.9	78.4
LF (%)	101.1	25.3	0.0	18.3	97.7	90.6	90.9	88.1	95.2	88.0	87.2	100.9	74.0
OF (%)	100.0	25.0	0.0	24.4	100.0	95.6	100.0	100.0	98.8	98.0	100.0	100.0	78.9
EUF (%)	0.0	75.1	100.0	81.7	0.9	5.5	0.7	0.4	2.6	4.4	0.2	0.1	22.2
PUF (%)	0.0	75.1	100.0	19.6	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	15.9
UCLF (%)	0.0	0.0	0.0	59.9	0.1	4.8	0.0	0.1	1.7	2.7	0.1	0.1	5.7
XUF (%)	0.0	0.0	0.0	2.2	0.5	0.7	0.7	0.3	0.9	1.7	0.0	0.0	0.6

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

BASE LOAD

### 5. Historical Summary

Date of Construction Start: 01 Apr 1975      Lifetime Generation: 186978.2 GW(e)·h

Date of First Criticality: 05 Dec 1980      Cumulative Energy Availability Factor: 77.5%

Date of Grid Connection: 10 Dec 1980      Cumulative Load Factor: 70.5%

Date of Commercial Operation: 16 Feb 1981      Cumulative Unit Capability Factor: 79.2%

Cumulative Energy Unavailability Factor: 22.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	5465.3	900	77.3	77.3	77.3	77.3	75.8	75.8	6670	83.2
1982	4110.8	890	53.0	64.7	53.0	64.7	52.7	63.8	4848	55.3
1983	5191.0	890	67.7	65.7	67.7	65.7	66.6	64.7	6139	70.1
1984	5781.0	890	76.1	68.4	76.1	68.4	73.9	67.1	6884	78.4
1985	6056.9	890	84.5	71.6	84.3	71.6	77.7	69.2	7400	84.5
1986	5658.5	890	82.2	73.4	82.0	73.3	72.6	69.8	6983	79.7
1987	4856.0	890	78.8	74.2	76.4	73.8	62.3	68.7	5715	65.2
1988	4583.0	890	95.1	76.8	92.4	76.1	58.6	67.4	6153	70.0
1989	5485.3	890	79.7	77.2	77.0	76.2	70.4	67.8	6927	79.1
1990	4869.5	890	69.9	76.4	67.8	75.4	62.5	67.2	6292	71.8
1991	4201.9	890	67.6	75.6	63.3	74.3	53.9	66.0	5407	61.7
1992	5049.8	890	75.9	75.6	74.7	74.3	64.6	65.9	6429	73.2
1993	5976.6	890	87.4	76.6	79.6	74.7	76.7	66.7	7625	87.0
1994	4445.0	890	84.8	77.1	84.8	75.4	57.0	66.0	5328	60.8
1995	5562.0	890	95.5	78.4	95.0	76.8	71.3	66.4	6952	79.4
1996	5761.0	890	84.2	78.7	81.5	77.0	73.7	66.8	7437	84.7
1997	4966.6	890	69.3	78.2	67.5	76.5	63.7	66.7	6204	70.8
1998	5855.9	890	80.3	78.3	78.3	76.6	75.1	67.1	7192	82.1
1999	5312.9	890	72.6	78.0	69.2	76.2	68.1	67.2	6688	76.3
2000	5866.1	890	77.6	78.0	76.0	76.2	75.0	67.6	7121	81.1
2001	5355.9	890	75.1	77.8	72.4	76.0	68.7	67.6	6593	75.3
2002	4307.5	890	56.3	76.9	56.0	75.1	55.3	67.1	5196	59.3
2003	6268.3	890	81.4	77.1	81.3	75.4	80.4	67.7	7631	87.1

2004	5983.9	890	95.7	77.8	93.7	76.1	76.5	68.0	7286	82.9
2005	5255.3	890	76.3	77.8	75.8	76.1	67.4	68.0	6719	76.7
2006	5880.5	890	85.5	78.1	83.2	76.4	75.4	68.3	7371	84.1
2007	6582.7	890	91.7	78.6	88.9	76.9	84.4	68.9	8201	93.6
2008	6014.9	890	84.0	78.8	82.1	77.0	76.9	69.2	7462	84.9
2009	6455.3	890	89.5	79.1	86.6	77.4	82.8	69.6	7902	90.2
2010	5399.8	890	72.8	78.9	71.2	77.2	69.3	69.6	6491	74.1
2011	6741.9	890	89.3	79.3	88.7	77.5	86.5	70.2	7890	90.1
2012	5118.0	890	68.1	78.9	67.4	77.2	65.5	70.0	6091	69.3
2013	6508.8	890	88.7	79.2	87.4	77.5	83.5	70.4	7666	87.5
2014	5771.7	890	78.4	79.2	77.8	77.5	74.0	70.5	6913	78.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		487			288	
B. Refuelling without a maintenance				74		
C. Inspection, maintenance or repair combined with refuelling	1343			989	13	
D. Inspection, maintenance or repair without refuelling				66		
E. Testing of plant systems or components				3	0	
H. Nuclear regulatory requirements					4	
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						2
L. Human factor related					16	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			16		1	2
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					10	
Z. Other					117	18
Subtotal	1343	487	16	1132	449	25
Total		1846			1606	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems	32	12
13. Reactor Auxiliary Systems		12
14. Safety Systems		22
15. Reactor Cooling Systems		38
16. Steam generation systems		25
21. Fuel Handling and Storage Facilities		7
31. Turbine and auxiliaries	14	55
32. Feedwater and Main Steam System		10
35. All other I&C Systems		0
41. Main Generator Systems		32
42. Electrical Power Supply Systems		26
XX. Miscellaneous Systems	440	40
Total	486	283

## FR-30 DAMPIERRE-3

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 890.0 MW(e)

Design Net Capacity: 890.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6746.7 GW(e)·h

Energy Availability Factor: 87.1%

Load Factor: 86.5%

Operating Factor: 89.3%

Energy Unavailability Factor: 12.9%

Total Off-line Time: 936 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	376.8	600.3	659.5	635.2	633.4	624.7	638.5	629.1	616.6	654.0	13.8	664.8	6746.7
EAF (%)	56.5	99.8	99.6	99.9	96.1	97.7	98.0	99.0	98.9	98.8	1.9	99.1	87.1
UCF (%)	56.5	99.8	99.6	100.0	96.5	99.2	99.6	99.6	99.9	100.0	5.3	99.1	87.9
LF (%)	56.9	100.4	99.7	99.1	95.7	97.5	96.4	95.0	96.2	98.6	2.1	100.4	86.5
OF (%)	66.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	5.0	100.0	89.3
EUf (%)	43.5	0.2	0.4	0.1	3.9	2.3	2.0	1.0	1.1	1.2	98.1	0.9	12.9
PUF (%)	8.6	0.2	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	94.7	0.8	8.6
UCLF (%)	34.9	0.0	0.4	0.0	3.5	0.8	0.2	0.2	0.1	0.0	0.0	0.1	3.4
XUF (%)	0.0	0.0	0.0	0.1	0.4	1.5	1.6	0.6	1.0	1.2	3.3	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Sep 1975      Lifetime Generation: 194157.3 GW(e)·h

Date of First Criticality: 25 Jan 1981      Cumulative Energy Availability Factor: 77.7%

Date of Grid Connection: 30 Jan 1981      Cumulative Load Factor: 73.5%

Date of Commercial Operation: 27 May 1981      Cumulative Unit Capability Factor: 79.3%

Cumulative Energy Unavailability Factor: 22.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	4043.7	900	78.0	78.0	78.0	78.0	76.4	76.4	4789	81.4
1982	3767.6	890	48.7	60.6	48.7	60.6	48.3	59.7	4632	52.9
1983	5517.0	890	72.7	65.1	72.7	65.1	70.8	63.8	6638	75.8
1984	6206.0	890	79.7	69.1	79.7	69.1	79.4	68.1	7121	81.1
1985	6364.4	890	85.1	72.5	84.9	72.4	81.6	71.0	7523	85.9
1986	6717.2	890	99.9	77.3	99.5	77.2	86.2	73.6	8330	95.1
1987	5019.5	890	82.4	78.1	79.3	77.5	64.4	72.2	6269	71.6
1988	4964.0	890	72.9	77.4	68.5	76.4	63.5	71.1	6435	73.3
1989	5912.9	890	82.2	77.9	78.4	76.6	75.8	71.7	7242	82.7
1990	5996.5	890	82.5	78.4	79.8	76.9	76.9	72.2	7348	83.9
1991	5124.1	890	70.0	77.6	69.6	76.2	65.7	71.6	6244	71.3
1992	4875.1	890	65.5	76.6	65.5	75.3	62.4	70.8	5814	66.2
1993	6148.8	890	82.8	77.1	82.8	75.9	78.9	71.4	7333	83.7
1994	5537.6	890	86.2	77.7	82.7	76.4	71.0	71.4	7013	80.1
1995	4773.5	890	83.4	78.1	80.2	76.7	61.2	70.7	6343	72.4
1996	5575.1	890	77.6	78.1	77.1	76.7	71.3	70.7	6940	79.0
1997	5720.9	890	81.0	78.3	78.3	76.8	73.4	70.9	7211	82.3
1998	5905.8	890	82.7	78.5	81.4	77.0	75.8	71.2	7210	82.3
1999	5779.4	890	80.9	78.7	78.2	77.1	74.1	71.3	7186	82.0
2000	4308.3	890	59.8	77.7	57.6	76.1	55.1	70.5	5378	61.2
2001	5993.0	890	77.8	77.7	77.4	76.2	76.9	70.8	7060	80.6
2002	5929.8	890	77.4	77.7	76.8	76.2	76.1	71.1	6877	78.5
2003	5346.9	890	69.0	77.3	68.9	75.9	68.6	71.0	6152	70.2

2004	6867.2	890	89.3	77.8	88.0	76.4	87.8	71.7	7920	90.2
2005	6242.4	890	86.5	78.2	84.1	76.7	80.1	72.0	7627	87.1
2006	6228.5	890	92.3	78.7	89.3	77.2	79.9	72.3	7991	91.2
2007	5614.1	890	78.7	78.7	76.0	77.2	72.0	72.3	6928	79.1
2008	6725.6	890	91.5	79.2	90.0	77.6	86.0	72.8	8100	92.2
2009	5365.0	890	74.8	79.0	71.0	77.4	68.8	72.7	6486	74.0
2010	6642.9	890	87.0	79.3	86.3	77.7	85.2	73.1	7660	87.4
2011	5999.4	890	79.4	79.3	78.4	77.7	77.0	73.2	7020	80.1
2012	6513.8	890	85.9	79.5	84.2	77.9	83.3	73.5	7595	86.5
2013	4747.6	890	65.8	79.1	61.1	77.4	60.9	73.1	5438	62.1
2014	6746.7	890	87.9	79.3	87.1	77.7	86.5	73.5	7824	89.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		230			294	
B. Refuelling without a maintenance	659			51		
C. Inspection, maintenance or repair combined with refuelling				1115	8	
D. Inspection, maintenance or repair without refuelling				24	1	
E. Testing of plant systems or components				4	0	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						2
L. Human factor related		20			19	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			24		3	14
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					6	1
Z. Other					94	
Subtotal	659	250	24	1194	425	17
Total		933			1636	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		7
14. Safety Systems		34
15. Reactor Cooling Systems		55
16. Steam generation systems		40
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System		9
33. Circulating Water System		0
35. All other I&C Systems		2
41. Main Generator Systems		27
42. Electrical Power Supply Systems		17
XX. Miscellaneous Systems	230	55
Total	230	289

# FR-31 DAMPIERRE-4

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 890.0 MW(e)

Design Net Capacity: 890.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 3970.8 GW(e)·h

Energy Availability Factor: 50.3%

Load Factor: 50.9%

Operating Factor: 51.4%

Energy Unavailability Factor: 49.7%

Total Off-line Time: 4253 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	674.5	608.1	674.1	388.2	0.0	0.0	0.0	0.0	0.0	312.8	645.8	667.3	3970.8
EAF (%)	100.0	99.9	100.0	60.0	0.0	0.0	0.0	0.0	0.0	47.1	99.7	99.9	50.3
UCF (%)	100.0	99.9	100.0	60.0	0.0	0.0	0.0	0.0	0.0	47.1	99.8	99.9	50.3
LF (%)	101.9	101.7	101.9	60.6	0.0	0.0	0.0	0.0	0.0	47.2	100.8	100.8	50.9
OF (%)	100.0	100.0	100.0	60.0	0.0	0.0	0.0	0.0	0.0	60.7	100.0	100.0	51.4
EUUF (%)	0.0	0.1	0.0	40.0	100.0	100.0	100.0	100.0	100.0	52.9	0.3	0.1	49.7
PUF (%)	0.0	0.1	0.0	40.0	100.0	100.0	100.0	100.0	35.0	11.5	0.3	0.1	40.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.0	41.4	0.0	0.0	8.9
XUF (%)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Dec 1975      Lifetime Generation: 185182.4 GW(e)·h

Date of First Criticality: 05 Aug 1981      Cumulative Energy Availability Factor: 76.1%

Date of Grid Connection: 18 Aug 1981      Cumulative Load Factor: 71.5%

Date of Commercial Operation: 20 Nov 1981      Cumulative Unit Capability Factor: 78.4%

Cumulative Energy Unavailability Factor: 23.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	1093.0	894	83.0	83.0	83.0	83.0	83.0	83.0	1300	88.8
1982	5745.6	890	81.8	82.0	81.8	82.0	73.7	75.0	7413	84.6
1983	4156.0	890	57.6	70.7	57.6	70.7	53.3	65.0	5207	59.4
1984	6276.0	890	85.1	75.3	85.1	75.3	80.3	69.8	7765	88.4
1985	5859.9	890	83.5	77.2	78.9	76.2	75.2	71.1	7387	84.3
1986	6664.9	890	88.8	79.5	88.5	78.5	85.5	73.9	7862	89.7
1987	5447.8	890	78.4	79.3	78.1	78.5	69.9	73.2	6795	77.6
1988	5086.0	890	82.9	79.8	79.9	78.7	65.1	72.1	6645	75.6
1989	5392.4	890	73.7	79.1	72.9	78.0	69.2	71.7	6621	75.6
1990	5153.0	890	91.2	80.4	87.3	79.0	66.1	71.1	6792	77.5
1991	6062.8	890	88.3	81.2	86.7	79.7	77.8	71.8	7612	86.9
1992	5331.5	890	76.7	80.8	74.5	79.3	68.2	71.5	6832	77.8
1993	4827.7	890	69.2	79.8	63.4	78.0	61.9	70.7	6103	69.7
1994	5264.0	890	80.7	79.9	79.5	78.1	67.5	70.4	7103	81.1
1995	5488.0	890	78.8	79.8	75.4	77.9	70.4	70.4	6997	79.9
1996	6118.5	890	83.7	80.1	82.9	78.2	78.3	70.9	7596	86.5
1997	5918.6	890	80.9	80.1	80.5	78.4	75.9	71.3	7178	81.9
1998	4506.5	890	60.6	79.0	59.0	77.2	57.8	70.5	5435	62.0
1999	4642.5	890	64.8	78.2	64.1	76.5	59.5	69.9	5770	65.9
2000	5598.7	890	76.0	78.1	75.2	76.4	71.6	70.0	6752	76.9
2001	5361.8	890	70.9	77.7	70.1	76.1	68.8	69.9	6422	73.3
2002	6134.5	890	85.3	78.1	83.8	76.5	78.7	70.3	7576	86.5
2003	5547.4	890	77.4	78.1	73.4	76.3	71.2	70.4	6759	77.2



2004	4531.8	890	61.3	77.3	59.4	75.6	58.0	69.8	5551	63.2
2005	6566.9	890	88.7	77.8	87.6	76.1	84.2	70.4	7956	90.8
2006	5905.4	890	85.8	78.1	83.6	76.4	75.7	70.6	7428	84.8
2007	5763.5	890	88.1	78.5	83.5	76.7	73.9	70.8	7384	84.3
2008	5249.1	890	68.8	78.1	67.5	76.3	67.1	70.6	6317	71.9
2009	6259.1	890	86.3	78.4	80.2	76.5	80.3	71.0	7151	81.6
2010	6472.4	890	83.2	78.6	82.6	76.7	83.0	71.4	7344	83.8
2011	6433.5	890	83.7	78.8	83.1	76.9	82.5	71.7	7506	85.7
2012	5014.6	890	82.6	78.9	63.6	76.5	64.1	71.5	5644	64.3
2013	7074.9	890	90.3	79.2	89.8	76.9	90.7	72.1	7942	90.7
2014	3970.8	890	50.3	78.4	50.3	76.1	50.9	71.5	4507	51.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		760			390	
B. Refuelling without a maintenance				75		
C. Inspection, maintenance or repair combined with refuelling	3492			944	24	
D. Inspection, maintenance or repair without refuelling				4	1	
E. Testing of plant systems or components				4	1	
H. Nuclear regulatory requirements					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						15
L. Human factor related					11	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						6
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					4	64
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					7	
Z. Other					87	6
Subtotal	3492	760	0	1027	526	91
Total		4252			1644	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		45
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		46
14. Safety Systems		7
15. Reactor Cooling Systems		15
16. Steam generation systems		91
21. Fuel Handling and Storage Facilities		12
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		26
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems		51
42. Electrical Power Supply Systems		3
XX. Miscellaneous Systems	760	54
Total	760	385

# FR-11 FESSENHEIM-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 880.0 MW(e)  
 Design Net Capacity: 880.0 MW(e)  
 Design Discharge Burnup: 44000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5361.1 GW(e)·h  
 Energy Availability Factor: 70.5%  
 Load Factor: 69.5%  
 Operating Factor: 73.5%  
 Energy Unavailability Factor: 29.5%  
 Total Off-line Time: 2319 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	629.2	579.6	641.9	183.5	64.4	560.3	596.4	623.7	532.6	0.0	331.4	618.1	5361.1
EAF (%)	97.2	98.3	98.1	29.0	9.8	90.1	92.6	96.7	84.7	0.0	53.5	97.7	70.5
UCF (%)	97.2	98.3	98.2	29.0	9.8	97.3	92.6	96.7	84.7	0.0	58.5	97.7	71.5
LF (%)	96.1	98.0	98.2	29.0	9.8	88.4	91.1	95.3	84.1	0.0	52.3	94.4	69.5
OF (%)	99.6	100.0	100.0	29.3	12.5	100.0	95.8	100.0	86.8	0.0	60.4	100.0	73.5
EUf (%)	2.8	1.7	1.9	71.0	90.2	9.9	7.4	3.3	15.3	100.0	46.5	2.3	29.5
PUF (%)	1.9	1.5	1.5	0.0	1.8	1.6	1.4	1.8	13.7	100.0	14.5	1.1	11.9
UCLF (%)	0.9	0.2	0.4	71.0	88.4	1.2	6.1	1.5	1.6	0.0	27.0	1.3	16.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	5.0	0.0	1.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Sep 1971      Lifetime Generation: 194423.4 GW(e)·h  
 Date of First Criticality: 07 Mar 1977      Cumulative Energy Availability Factor: 70.8%  
 Date of Grid Connection: 06 Apr 1977      Cumulative Load Factor: 67.8%  
 Date of Commercial Operation: 01 Jan 1978      Cumulative Unit Capability Factor: 72.0%  
 Cumulative Energy Unavailability Factor: 29.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1978	6079.2	890	78.2	78.2	78.2	78.2	78.0	78.0	7302	83.4
1979	4542.0	890	58.8	68.5	58.8	68.5	58.3	68.1	5338	60.9
1980	5510.0	890	70.7	69.2	70.7	69.2	70.5	68.9	6350	72.3
1981	5065.3	890	65.3	68.2	65.3	68.2	65.0	67.9	5844	66.7
1982	1848.2	880	24.0	59.5	24.0	59.5	24.0	59.2	2138	24.4
1983	5690.0	880	75.3	62.1	75.3	62.1	73.8	61.6	6701	76.5
1984	6503.0	880	85.2	65.4	85.2	65.4	84.1	64.8	7731	88.0
1985	6044.6	880	80.4	67.2	79.8	67.2	78.4	66.5	7105	81.1
1986	5661.3	880	75.1	68.1	74.7	68.0	73.4	67.3	6702	76.5
1987	5029.6	880	74.1	68.7	73.6	68.6	65.2	67.1	6147	70.2
1988	5399.0	880	86.5	70.3	77.9	69.4	69.8	67.3	7069	80.5
1989	3253.3	880	46.1	68.3	43.4	67.3	42.2	65.2	4108	46.9
1990	5036.7	880	79.6	69.2	74.6	67.8	65.3	65.3	6481	74.0
1991	4053.5	880	55.7	68.2	55.5	66.9	52.6	64.4	4900	55.9
1992	4867.1	880	67.2	68.2	66.9	66.9	63.0	64.3	6079	69.2
1993	5548.7	880	81.0	68.9	74.6	67.4	72.0	64.7	7161	81.7
1994	6186.1	880	87.4	70.0	86.5	68.5	80.2	65.6	7508	85.7
1995	5856.1	880	85.5	70.9	84.7	69.4	76.0	66.2	6990	79.8
1996	6165.0	880	85.3	71.6	85.2	70.3	79.8	66.9	7544	85.9
1997	5826.8	880	81.6	72.1	81.5	70.8	75.6	67.4	7209	82.3
1998	4617.1	880	64.3	71.8	61.7	70.4	59.9	67.0	5727	65.4
1999	5228.8	880	71.2	71.7	70.8	70.4	67.8	67.0	6283	71.7
2000	5782.6	880	81.1	72.1	80.8	70.9	74.8	67.4	7145	81.3

2001	5507.5	880	79.6	72.5	78.4	71.2	71.4	67.6	7095	81.0
2002	2989.7	880	42.9	71.3	41.1	70.0	38.8	66.4	3832	43.7
2003	6985.2	880	98.2	72.3	96.5	71.0	90.6	67.3	8518	97.2
2004	3726.5	880	50.2	71.5	49.6	70.2	48.2	66.6	4500	51.2
2005	5448.4	880	75.4	71.6	75.3	70.4	70.7	66.8	6673	76.2
2006	6875.7	880	94.1	72.4	93.5	71.2	89.2	67.5	8338	95.2
2007	4667.0	880	63.2	72.1	61.1	70.8	60.5	67.3	5715	65.2
2008	5147.4	880	67.9	72.0	66.8	70.7	66.6	67.3	6120	69.7
2009	5382.8	880	71.4	71.9	70.1	70.7	69.8	67.4	6365	72.7
2010	5181.5	880	68.1	71.8	68.0	70.6	67.2	67.4	6209	70.9
2011	5187.8	880	68.5	71.7	68.0	70.5	67.3	67.4	6197	70.7
2012	7031.4	880	92.5	72.3	92.4	71.2	91.0	68.0	8158	92.9
2013	4453.5	880	60.2	72.0	58.1	70.8	57.8	67.7	5419	61.9
2014	5361.1	880	71.5	72.0	70.5	70.8	69.5	67.8	6441	73.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1381			793	
B. Refuelling without a maintenance	899			28		
C. Inspection, maintenance or repair combined with refuelling				1138	10	
D. Inspection, maintenance or repair without refuelling				56	8	
E. Testing of plant systems or components				13	0	
H. Nuclear regulatory requirements					47	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						2
L. Human factor related					92	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			25			0
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			10		5	0
Z. Other					2	0
Subtotal	899	1381	35	1235	957	2
Total		2315			2194	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		268
12. Reactor I&C Systems	140	33
13. Reactor Auxiliary Systems		9
14. Safety Systems		50
15. Reactor Cooling Systems		54
16. Steam generation systems		26
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries	2	124
32. Feedwater and Main Steam System	26	28
35. All other I&C Systems		5
41. Main Generator Systems		95
42. Electrical Power Supply Systems	1160	27
XX. Miscellaneous Systems	51	67
Total	1379	788

## FR-12 FESSENHEIM-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 880.0 MW(e)

Design Net Capacity: 880.0 MW(e)

Design Discharge Burnup: 44000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6875.0 GW(e)·h

Energy Availability Factor: 91.7%

Load Factor: 89.2%

Operating Factor: 94.1%

Energy Unavailability Factor: 8.3%

Total Off-line Time: 516 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	564.5	567.6	603.7	594.0	626.9	541.1	623.3	626.8	606.5	458.1	566.7	495.7	6875.0
EAF (%)	93.3	98.0	98.9	94.7	99.3	88.6	97.0	97.5	97.0	71.2	89.8	75.9	91.7
UCF (%)	93.3	98.0	98.9	94.7	99.3	98.7	98.2	97.5	97.0	76.5	89.8	75.9	93.1
LF (%)	86.2	96.0	92.3	93.7	95.7	85.4	95.2	95.7	95.7	69.9	89.4	75.7	89.2
OF (%)	94.9	100.0	96.8	96.0	100.0	100.0	100.0	100.0	100.0	72.8	91.9	78.0	94.1
EUf (%)	6.7	2.0	1.1	5.3	0.7	11.4	3.0	2.5	3.0	28.8	10.2	24.1	8.3
PUF (%)	0.9	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
UCLF (%)	5.8	0.6	1.1	5.3	0.7	1.3	1.8	2.5	3.0	23.5	10.2	24.1	6.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	10.1	1.2	0.0	0.0	5.2	0.0	0.0	1.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

BASE LOAD

### 5. Historical Summary

Date of Construction Start: 01 Feb 1972      Lifetime Generation: 196755.3 GW(e)·h

Date of First Criticality: 27 Jun 1977      Cumulative Energy Availability Factor: 72.9%

Date of Grid Connection: 07 Oct 1977      Cumulative Load Factor: 69.0%

Date of Commercial Operation: 01 Apr 1978      Cumulative Unit Capability Factor: 74.1%

Cumulative Energy Unavailability Factor: 27.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1978	4785.8	890	82.7	82.7	81.8	81.8	81.5	81.5	5648	85.6
1979	4521.0	890	58.7	69.0	58.7	68.6	58.0	68.1	5684	64.9
1980	5601.0	890	72.2	70.2	72.2	69.9	71.6	69.4	6603	75.2
1981	6055.0	890	79.4	72.6	79.4	72.5	77.7	71.6	7117	81.2
1982	6047.9	880	93.1	76.9	93.1	76.8	78.5	73.0	8247	94.1
1983	4315.0	880	58.2	73.7	58.2	73.6	56.0	70.1	5206	59.4
1984	6459.0	880	88.4	75.9	88.4	75.8	83.6	72.1	7860	89.5
1985	5917.2	880	80.0	76.4	78.6	76.1	76.8	72.7	7248	82.7
1986	5522.5	880	73.4	76.1	73.2	75.8	71.6	72.5	6573	75.0
1987	6150.1	880	83.6	76.8	82.6	76.5	79.8	73.3	7335	83.7
1988	4830.0	880	72.4	76.4	69.8	75.9	62.5	72.3	6158	70.1
1989	5643.4	880	97.0	78.2	96.2	77.6	73.2	72.4	6944	79.3
1990	3552.4	880	52.0	76.1	49.6	75.4	46.1	70.3	4612	52.6
1991	5308.4	880	73.3	75.9	72.8	75.2	68.9	70.2	6537	74.6
1992	2202.0	880	29.9	72.8	29.9	72.1	28.5	67.4	2699	30.7
1993	5775.1	880	81.0	73.3	77.6	72.5	74.9	67.9	7167	81.8
1994	5294.9	880	98.5	74.8	98.2	74.0	68.7	67.9	6807	77.7
1995	5098.3	880	71.5	74.6	70.5	73.8	66.1	67.8	6305	72.0
1996	6192.1	880	84.9	75.2	84.4	74.4	80.1	68.5	7515	85.6
1997	5808.6	880	80.6	75.5	80.0	74.7	75.3	68.8	6982	79.7
1998	5597.0	880	75.9	75.5	73.7	74.6	72.6	69.0	6797	77.6
1999	6392.6	880	87.1	76.0	86.4	75.2	82.9	69.6	7708	88.0
2000	3730.4	880	51.4	74.9	51.1	74.1	48.3	68.7	4514	51.4

2001	6699.9	880	88.6	75.5	87.3	74.7	86.9	69.5	7876	89.9
2002	6562.6	880	87.1	76.0	85.6	75.1	85.1	70.1	7729	88.2
2003	4589.5	880	60.7	75.4	60.7	74.5	59.5	69.7	5434	62.0
2004	6913.7	880	94.5	76.1	93.6	75.3	89.4	70.4	8435	96.0
2005	6381.2	880	87.6	76.5	85.1	75.6	82.8	70.9	7813	89.2
2006	4803.1	880	64.7	76.1	64.7	75.2	62.3	70.6	5844	66.7
2007	4816.7	880	64.5	75.7	62.9	74.8	62.5	70.3	5781	66.0
2008	5131.4	880	68.5	75.5	66.8	74.6	66.4	70.2	6384	72.7
2009	3366.6	880	47.1	74.6	43.9	73.6	43.7	69.3	4206	48.0
2010	6573.1	880	89.8	75.0	87.0	74.0	85.3	69.8	8100	92.5
2011	1976.9	880	27.8	73.6	25.7	72.6	25.6	68.5	2521	28.8
2012	5427.8	880	79.3	73.8	73.1	72.6	70.2	68.6	6584	75.0
2013	4815.3	880	66.2	73.6	63.3	72.3	62.5	68.4	5841	66.7
2014	6875.0	880	93.1	74.1	91.7	72.9	89.2	69.0	8244	94.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1978 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		453			674	3
B. Refuelling without a maintenance				19		
C. Inspection, maintenance or repair combined with refuelling				1217	6	
D. Inspection, maintenance or repair without refuelling				54	21	
E. Testing of plant systems or components				18	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements					15	
J. Grid limitation, failure or grid unavailability			28			
L. Human factor related					13	0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						12
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			39			27
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						12
Z. Other					14	
Subtotal	0	453	67	1308	744	54
Total		520			2106	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1978 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		47
12. Reactor I&C Systems		32
13. Reactor Auxiliary Systems		45
14. Safety Systems	163	24
15. Reactor Cooling Systems		26
16. Steam generation systems		174
21. Fuel Handling and Storage Facilities		9
31. Turbine and auxiliaries	29	72
32. Feedwater and Main Steam System	163	52
33. Circulating Water System		4
35. All other I&C Systems		0
41. Main Generator Systems	38	57
42. Electrical Power Supply Systems	57	7

XX. Miscellaneous Systems		123
Total	450	672

# FR-46 FLAMANVILLE-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1330.0 MW(e)  
 Design Net Capacity: 1330.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8767.1 GW(e)·h  
 Energy Availability Factor: 78.0%  
 Load Factor: 75.2%  
 Operating Factor: 79.9%  
 Energy Unavailability Factor: 22.0%  
 Total Off-line Time: 1758 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	885.3	240.6	0.0	709.8	936.5	626.0	847.9	927.7	924.0	849.1	865.8	954.5	8767.1
EAF (%)	97.0	27.2	0.0	76.5	96.9	66.9	93.4	98.4	98.1	87.2	92.2	97.5	78.0
UCF (%)	97.0	60.9	0.0	76.5	98.8	67.0	94.0	99.2	99.1	87.8	94.3	98.5	81.2
LF (%)	89.5	26.9	0.0	74.1	94.6	65.4	85.7	93.7	96.5	85.7	90.4	96.5	75.2
OF (%)	95.3	28.3	0.0	83.2	100.0	67.5	94.0	99.7	100.0	90.1	96.9	100.0	79.9
EUUF (%)	3.0	72.8	100.0	23.5	3.1	33.1	6.6	1.6	1.9	12.8	7.8	2.5	22.0
PUF (%)	0.1	39.0	94.3	7.2	0.1	0.0	1.1	0.2	0.1	0.0	0.1	0.1	11.7
UCLF (%)	2.9	0.1	5.7	16.3	1.2	33.0	5.0	0.6	0.8	12.2	5.6	1.4	7.0
XUF (%)	0.0	33.6	0.0	0.0	1.9	0.2	0.5	0.8	1.0	0.6	2.1	1.0	3.3

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

BASE LOAD

## 5. Historical Summary

Date of Construction Start: 01 Dec 1979      Lifetime Generation: 231424.4 GW(e)·h  
 Date of First Criticality: 29 Sep 1985      Cumulative Energy Availability Factor: 74.3%  
 Date of Grid Connection: 04 Dec 1985      Cumulative Load Factor: 69.6%  
 Date of Commercial Operation: 01 Dec 1986      Cumulative Unit Capability Factor: 76.9%  
    Cumulative Energy Unavailability Factor: 25.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	965.9	1290	97.3	97.3	97.3	97.3	100.6	100.6	726	97.6
1987	7150.8	1290	63.2	65.9	62.2	64.9	63.3	66.2	5656	64.6
1988	7175.0	1330	67.4	66.6	66.0	65.5	61.4	63.9	5757	65.5
1989	8775.2	1330	81.0	71.3	80.6	70.4	75.3	67.6	7146	81.6
1990	7090.0	1330	67.0	70.3	65.7	69.2	60.9	65.9	6360	72.6
1991	5882.9	1330	68.4	69.9	59.4	67.3	50.5	62.9	5481	62.6
1992	7606.8	1330	66.2	69.3	66.2	67.1	65.1	63.3	5901	67.2
1993	9301.8	1330	96.8	73.2	87.2	70.0	79.8	65.6	7936	90.6
1994	7145.8	1330	80.1	74.0	75.3	70.6	61.3	65.1	6515	74.4
1995	7665.1	1330	77.4	74.4	73.2	70.9	65.8	65.2	6654	76.0
1996	8598.3	1330	84.6	75.4	77.8	71.6	73.6	66.0	7050	80.3
1997	6853.9	1330	63.9	74.4	62.3	70.8	58.8	65.3	5529	63.1
1998	9469.4	1330	86.7	75.4	86.7	72.1	81.3	66.7	7855	89.7
1999	6979.4	1330	66.1	74.7	64.4	71.5	59.9	66.2	5906	67.4
2000	8035.3	1330	75.6	74.8	74.5	71.7	68.8	66.3	6607	75.2
2001	10038.5	1330	92.6	75.9	92.5	73.1	86.2	67.7	8126	92.8
2002	8141.8	1330	75.5	75.9	73.1	73.1	69.9	67.8	6736	76.9
2003	7510.8	1330	68.2	75.5	67.8	72.8	64.5	67.6	6090	69.5
2004	10630.0	1330	98.2	76.7	96.8	74.1	91.0	68.9	8668	98.7
2005	9099.9	1330	85.6	77.2	83.3	74.6	78.1	69.4	7627	87.1
2006	7790.9	1330	72.5	77.0	69.1	74.3	66.9	69.3	6675	76.2
2007	9595.6	1330	90.5	77.6	89.0	75.0	82.4	69.9	8041	91.8
2008	4962.4	1330	43.8	76.1	42.9	73.6	42.5	68.6	4018	45.7

2009	6956.7	1330	68.2	75.7	62.7	73.1	59.7	68.2	5593	63.8
2010	8519.7	1330	77.6	75.8	75.8	73.2	73.1	68.4	6955	79.4
2011	9572.7	1330	87.4	76.3	87.2	73.8	82.2	69.0	7768	88.7
2012	6778.1	1330	65.9	75.9	61.4	73.3	58.0	68.6	5618	64.0
2013	10422.8	1330	98.8	76.7	97.5	74.2	89.5	69.3	8682	99.1
2014	8767.1	1330	81.2	76.9	78.0	74.3	75.2	69.6	7002	79.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		492			823	
B. Refuelling without a maintenance	962			57		
C. Inspection, maintenance or repair combined with refuelling				846		
D. Inspection, maintenance or repair without refuelling				26		
E. Testing of plant systems or components	9			10	1	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			46			
L. Human factor related		28			13	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			219			15
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant, spare part delivery problems etc.)					1	34
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						7
Z. Other					19	0
Subtotal	971	520	265	939	857	57
Total		1756			1853	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		105
12. Reactor I&C Systems		34
13. Reactor Auxiliary Systems		43
14. Safety Systems	12	12
15. Reactor Cooling Systems		20
16. Steam generation systems		55
21. Fuel Handling and Storage Facilities		10
31. Turbine and auxiliaries	274	140
32. Feedwater and Main Steam System	12	59
33. Circulating Water System		18
35. All other I&C Systems		2
41. Main Generator Systems		122
42. Electrical Power Supply Systems	108	114
XX. Miscellaneous Systems	86	84
Total	492	818



## FR-47 FLAMANVILLE-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1330.0 MW(e)

Design Net Capacity: 1330.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 9693.9 GW(e)·h

Energy Availability Factor: 84.8%

Load Factor: 83.2%

Operating Factor: 86.9%

Energy Unavailability Factor: 15.2%

Total Off-line Time: 1150 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	982.0	856.9	961.8	946.6	983.8	166.1	392.3	908.7	739.0	971.5	945.4	839.7	9693.9
EAF (%)	100.0	99.9	98.2	100.0	99.9	17.7	40.5	99.4	78.3	99.3	99.4	85.2	84.8
UCF (%)	100.0	99.9	98.2	100.0	99.9	17.7	44.0	100.0	78.7	100.0	99.7	85.2	85.3
LF (%)	99.2	95.9	97.3	98.9	99.4	17.3	39.6	91.8	77.2	98.0	98.7	84.9	83.2
OF (%)	100.0	100.0	100.0	100.0	100.0	20.3	45.7	98.9	89.7	100.0	100.0	87.9	86.9
EUf (%)	0.0	0.1	1.8	0.0	0.1	82.3	59.5	0.6	21.7	0.7	0.6	14.8	15.2
PUf (%)	0.0	0.0	0.0	0.0	0.0	80.1	36.7	0.0	0.0	0.0	0.0	0.0	9.7
UCLF (%)	0.0	0.1	1.8	0.0	0.0	2.2	19.3	0.0	21.3	0.0	0.3	14.8	5.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.5	0.4	0.6	0.3	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 May 1980      Lifetime Generation: 234233.7 GW(e)·h

Date of First Criticality: 12 Jun 1986      Cumulative Energy Availability Factor: 77.4%

Date of Grid Connection: 18 Jul 1986      Cumulative Load Factor: 71.3%

Date of Commercial Operation: 09 Mar 1987      Cumulative Unit Capability Factor: 78.8%

Cumulative Energy Unavailability Factor: 22.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	5578.8	1290	88.9	88.9	88.7	88.7	58.9	58.9	5094	69.4
1988	7106.0	1330	67.4	77.1	65.4	75.8	60.8	60.0	5674	64.6
1989	4824.5	1330	50.6	67.7	48.7	66.2	41.4	53.4	3836	43.8
1990	7819.6	1330	76.6	70.0	75.7	68.7	67.1	57.0	6392	73.0
1991	7965.7	1330	72.3	70.5	70.6	69.1	68.4	59.3	6432	73.4
1992	8842.4	1330	78.2	71.8	78.0	70.6	75.7	62.2	6962	79.3
1993	7985.2	1330	71.4	71.8	69.1	70.4	68.5	63.1	6338	72.4
1994	8384.3	1330	75.4	72.2	75.3	71.0	72.0	64.2	6711	76.6
1995	8962.4	1330	82.1	73.3	81.4	72.2	76.9	65.7	7264	82.9
1996	9387.5	1330	87.5	74.8	86.6	73.7	80.4	67.2	7685	87.5
1997	8546.0	1330	95.4	76.7	95.3	75.7	73.4	67.7	7351	83.9
1998	5656.6	1330	55.4	74.9	55.4	74.0	48.6	66.1	4880	55.7
1999	7248.9	1330	67.4	74.3	65.2	73.3	62.2	65.8	6034	68.9
2000	9907.9	1330	94.2	75.8	93.7	74.8	84.8	67.2	8122	92.5
2001	8565.1	1330	77.9	75.9	76.2	74.9	73.5	67.6	6863	78.3
2002	8502.3	1330	78.1	76.0	77.9	75.1	73.0	68.0	6839	78.1
2003	10065.3	1330	93.6	77.1	93.4	76.1	86.4	69.1	8365	95.5
2004	7499.8	1330	68.3	76.6	66.8	75.6	64.2	68.8	6125	69.7
2005	9779.1	1330	89.1	77.3	86.7	76.2	83.9	69.6	7894	90.1
2006	10125.8	1330	98.0	78.3	97.5	77.3	86.9	70.5	8438	96.3
2007	8063.0	1330	78.3	78.3	76.5	77.2	69.2	70.4	7021	80.1
2008	6140.9	1330	57.9	77.4	54.4	76.2	52.6	69.6	5052	57.5
2009	9531.8	1330	90.9	78.0	88.4	76.7	81.8	70.1	8016	91.5

2010	7594.3	1330	75.2	77.8	68.8	76.4	65.2	69.9	6329	72.2
2011	9342.7	1330	83.8	78.1	83.5	76.7	80.2	70.3	7438	84.9
2012	10359.0	1330	99.5	78.9	99.3	77.6	88.7	71.0	8733	99.4
2013	7631.6	1330	70.7	78.6	66.3	77.1	65.5	70.8	6183	70.6
2014	9693.9	1330	85.3	78.8	84.8	77.4	83.2	71.3	7610	86.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		291			601	
B. Refuelling without a maintenance	815			50		
C. Inspection, maintenance or repair combined with refuelling				885	27	
D. Inspection, maintenance or repair without refuelling				79		
E. Testing of plant systems or components				19	1	0
H. Nuclear regulatory requirements					16	
J. Grid limitation, failure or grid unavailability						8
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			8			
L. Human factor related		10			5	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						9
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			24		1	17
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				1		
Z. Other					19	
Subtotal	815	301	32	1034	670	34
Total		1148			1738	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		29
13. Reactor Auxiliary Systems		45
14. Safety Systems	19	17
15. Reactor Cooling Systems		161
16. Steam generation systems	33	55
17. Safety I&C Systems (excluding reactor I&C)		3
21. Fuel Handling and Storage Facilities	27	6
31. Turbine and auxiliaries	13	88
32. Feedwater and Main Steam System		36
35. All other I&C Systems	130	1
41. Main Generator Systems		48
42. Electrical Power Supply Systems		62
XX. Miscellaneous Systems	68	34
Total	290	595

# FR-61 GOLFECH-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1310.0 MW(e)  
 Design Net Capacity: 1310.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8149.6 GW(e)·h  
 Energy Availability Factor: 76.1%  
 Load Factor: 71.0%  
 Operating Factor: 76.8%  
 Energy Unavailability Factor: 23.9%  
 Total Off-line Time: 2032 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	893.0	820.9	894.2	871.9	867.9	827.0	938.8	940.2	575.4	0.0	0.0	520.2	8149.6
EAF (%)	99.6	99.8	100.0	100.0	100.0	98.1	99.9	99.9	63.4	0.0	0.0	53.7	76.1
UCF (%)	99.6	99.8	100.0	100.0	100.0	100.0	100.0	99.9	63.4	0.0	16.7	60.2	78.2
LF (%)	91.6	93.3	91.9	92.4	89.0	87.7	96.3	96.5	61.0	0.0	0.0	53.4	71.0
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.8	0.0	0.0	58.9	76.8
EUf (%)	0.4	0.2	0.0	0.0	0.0	1.9	0.1	0.1	36.6	100.0	100.0	46.3	23.9
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	36.6	100.0	67.1	4.4	17.4
UCLF (%)	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	16.3	35.5	4.4
XUF (%)	0.0	0.0	0.0	0.0	0.0	1.9	0.1	0.0	0.0	0.0	16.7	6.4	2.1

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 17 Nov 1982      Lifetime Generation: 210919.9 GW(e)·h  
 Date of First Criticality: 24 Apr 1990      Cumulative Energy Availability Factor: 82.5%  
 Date of Grid Connection: 07 Jun 1990      Cumulative Load Factor: 76.0%  
 Date of Commercial Operation: 01 Feb 1991      Cumulative Unit Capability Factor: 85.0%  
    Cumulative Energy Unavailability Factor: 17.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1991	8871.6	1310	97.8	97.8	96.1	96.1	84.5	84.5	7608	94.9
1992	7065.9	1310	67.9	82.1	64.3	79.5	61.4	72.4	6128	69.8
1993	7925.6	1310	82.6	82.3	72.7	77.1	69.1	71.3	7143	81.5
1994	7756.1	1310	81.3	82.0	77.8	77.3	67.6	70.3	7215	82.4
1995	7897.8	1310	83.5	82.3	75.6	77.0	68.8	70.0	7005	80.0
1996	8862.4	1310	84.8	82.8	83.2	78.0	77.0	71.2	7598	86.5
1997	9151.6	1310	94.6	84.5	94.5	80.4	79.7	72.4	8000	91.3
1998	8576.6	1310	84.7	84.5	81.1	80.5	74.7	72.7	7472	85.3
1999	7926.3	1310	80.8	84.1	77.2	80.1	69.1	72.3	6837	78.0
2000	8766.3	1310	94.1	85.1	93.9	81.5	76.2	72.7	7901	89.9
2001	7511.9	1310	69.1	83.6	68.4	80.3	65.5	72.0	6147	70.2
2002	9242.4	1310	82.5	83.5	81.4	80.4	80.5	72.8	7301	83.3
2003	10342.7	1310	99.2	84.8	93.9	81.5	90.1	74.1	8252	94.2
2004	9051.1	1310	87.6	85.0	84.7	81.7	78.7	74.4	7721	87.9
2005	8653.5	1310	78.7	84.5	78.7	81.5	75.4	74.5	7014	80.1
2006	9475.1	1310	88.7	84.8	85.7	81.8	82.6	75.0	7848	89.6
2007	9517.6	1310	98.2	85.6	97.7	82.7	82.9	75.5	8554	97.6
2008	8556.9	1310	80.0	85.3	77.8	82.4	74.4	75.4	7104	80.9
2009	9662.4	1310	89.9	85.5	87.6	82.7	84.2	75.9	7932	90.5
2010	8888.7	1310	83.9	85.4	81.7	82.6	77.5	76.0	7290	83.2
2011	9830.1	1310	98.3	86.1	97.8	83.4	85.7	76.4	8546	97.6
2012	7272.4	1310	65.7	85.1	64.6	82.5	63.2	75.8	5889	67.0
2013	9694.3	1310	88.5	85.3	87.8	82.7	84.5	76.2	7793	89.0

2014	8149.6	1310	78.2	85.0	76.1	82.5	71.0	76.0	6728	76.8
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## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		374			181	
B. Refuelling without a maintenance				52		
C. Inspection, maintenance or repair combined with refuelling	1488			816	1	
D. Inspection, maintenance or repair without refuelling				45		
E. Testing of plant systems or components				48		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				4		
H. Nuclear regulatory requirements					4	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						3
L. Human factor related					28	1
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			47			18
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant, spare part delivery problems etc.)			120		0	9
Z. Other					11	0
Subtotal	1488	374	167	965	225	31
Total		2029			1221	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		20
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		6
14. Safety Systems		10
15. Reactor Cooling Systems		21
16. Steam generation systems		5
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		7
33. Circulating Water System		4
35. All other I&C Systems		2
41. Main Generator Systems		33
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems	374	51
Total	374	175

## FR-68 GOLFECH-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1310.0 MW(e)

Design Net Capacity: 1310.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6885.1 GW(e)·h

Energy Availability Factor: 64.9%

Load Factor: 60.0%

Operating Factor: 67.2%

Energy Unavailability Factor: 35.1%

Total Off-line Time: 2875 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	906.9	825.7	938.0	698.0	0.0	0.0	0.0	190.0	865.3	782.5	808.0	870.5	6885.1
EAF (%)	100.0	100.0	98.5	74.0	0.0	0.0	0.0	20.4	99.8	92.4	97.4	100.0	64.9
UCF (%)	100.0	100.0	100.0	83.4	0.0	0.0	0.0	27.2	99.8	97.1	99.5	100.0	66.9
LF (%)	93.1	93.8	96.4	74.0	0.0	0.0	0.0	19.5	91.7	80.2	85.7	89.3	60.0
OF (%)	100.0	100.0	100.0	83.8	0.0	0.0	0.0	28.9	100.0	97.2	100.0	100.0	67.2
EUf (%)	0.0	0.0	1.5	26.0	100.0	100.0	100.0	79.6	0.2	7.6	2.6	0.0	35.1
PUf (%)	0.0	0.0	0.0	16.6	100.0	100.0	100.0	37.0	0.1	0.0	0.1	0.0	29.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.8	0.1	2.9	0.4	0.0	3.3
XUF (%)	0.0	0.0	1.5	9.4	0.0	0.0	0.0	6.8	0.0	4.7	2.1	0.0	2.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Oct 1984      Lifetime Generation: 184034.9 GW(e)·h

Date of First Criticality: 21 May 1993      Cumulative Energy Availability Factor: 83.6%

Date of Grid Connection: 18 Jun 1993      Cumulative Load Factor: 75.7%

Date of Commercial Operation: 04 Mar 1994      Cumulative Unit Capability Factor: 85.3%

Cumulative Energy Unavailability Factor: 16.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1994	6507.6	1310	99.7	99.7	99.4	99.4	67.6	67.6	5912	80.5
1995	7030.1	1310	66.7	81.7	62.9	79.6	61.3	64.2	6002	68.5
1996	9016.4	1310	84.7	82.8	83.6	81.0	78.4	69.2	7549	85.9
1997	8649.9	1310	83.7	83.0	80.2	80.8	75.4	70.8	7414	84.6
1998	8359.6	1310	85.1	83.4	82.9	81.2	72.8	71.2	7222	82.4
1999	9516.9	1310	98.0	85.9	97.7	84.0	82.9	73.2	8407	96.0
2000	8877.6	1310	84.5	85.7	81.8	83.7	77.1	73.8	7535	85.8
2001	8958.3	1310	85.3	85.7	84.3	83.8	78.1	74.3	7586	86.6
2002	9847.1	1310	97.3	87.0	97.3	85.3	85.8	75.6	8553	97.6
2003	7614.9	1310	77.7	86.0	75.2	84.3	66.4	74.7	7115	81.2
2004	7093.7	1310	65.7	84.2	65.7	82.6	61.6	73.5	6129	69.8
2005	9936.3	1310	99.2	85.4	98.9	84.0	86.6	74.6	8715	99.5
2006	8516.6	1310	84.8	85.4	78.2	83.5	74.2	74.6	7150	81.6
2007	9922.0	1310	90.9	85.8	90.2	84.0	86.5	75.4	8026	91.6
2008	8484.2	1310	79.2	85.3	76.7	83.5	73.7	75.3	7095	80.8
2009	9982.8	1310	99.5	86.2	96.6	84.3	87.0	76.0	8301	94.8
2010	9076.1	1310	85.8	86.2	83.6	84.3	79.1	76.2	7574	86.5
2011	8848.4	1310	81.4	85.9	80.2	84.1	77.1	76.3	7177	81.9
2012	8580.1	1310	81.0	85.7	81.0	83.9	74.6	76.2	7152	81.4
2013	9498.6	1310	96.1	86.2	96.1	84.5	82.8	76.5	8292	94.7
2014	6885.1	1310	66.9	85.3	64.9	83.6	60.0	75.7	5885	67.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1993 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		266			265	
B. Refuelling without a maintenance				86		
C. Inspection, maintenance or repair combined with refuelling	2517			656	1	
D. Inspection, maintenance or repair without refuelling				6		
E. Testing of plant systems or components	58			37		
H. Nuclear regulatory requirements					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						1
L. Human factor related		21			14	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						9
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			24		29	0
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					4	
Z. Other					11	19
Subtotal	2575	287	24	785	325	29
Total		2886			1139	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1993 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		44
13. Reactor Auxiliary Systems		5
14. Safety Systems		3
15. Reactor Cooling Systems		8
16. Steam generation systems		2
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		31
32. Feedwater and Main Steam System		0
33. Circulating Water System		1
41. Main Generator Systems		115
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems	266	40
Total	266	259

# FR-20 GRAVELINES-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 910.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6111.9 GW(e)·h

Energy Availability Factor: 82.6%

Load Factor: 76.7%

Operating Factor: 84.7%

Energy Unavailability Factor: 17.4%

Total Off-line Time: 1344 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	664.5	602.5	449.6	4.5	626.5	593.2	515.8	489.0	257.4	647.0	626.7	635.3	6111.9
EAF (%)	99.7	99.9	67.6	0.7	94.1	98.7	96.4	92.9	43.6	97.4	99.6	99.2	82.6
UCF (%)	99.7	99.9	67.7	0.7	94.4	99.9	98.4	95.6	44.5	98.7	99.8	99.2	83.3
LF (%)	98.1	98.5	66.5	0.7	92.5	90.5	76.2	72.2	39.3	95.4	95.6	93.8	76.7
OF (%)	100.0	100.0	67.8	3.2	100.0	100.0	100.0	96.4	47.1	100.0	100.0	100.0	84.7
EUUF (%)	0.3	0.1	32.4	99.3	5.9	1.3	3.6	7.1	56.4	2.6	0.4	0.8	17.4
PUF (%)	0.1	0.0	32.4	99.3	5.6	0.0	0.3	0.1	29.7	0.1	0.2	0.0	13.9
UCLF (%)	0.2	0.1	0.0	0.0	0.0	0.1	1.4	4.3	25.9	1.2	0.0	0.8	2.8
XUF (%)	0.0	0.0	0.0	0.0	0.2	1.2	1.9	2.7	0.9	1.3	0.3	0.0	0.7

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Feb 1975      Lifetime Generation: 191923.2 GW(e)·h

Date of First Criticality: 21 Feb 1980      Cumulative Energy Availability Factor: 75.2%

Date of Grid Connection: 13 Mar 1980      Cumulative Load Factor: 70.1%

Date of Commercial Operation: 25 Nov 1980      Cumulative Unit Capability Factor: 77.0%

Cumulative Energy Unavailability Factor: 24.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	920.0	918	68.4	68.4	68.4	68.4	68.3	68.3	1037	70.8
1981	5001.8	920	63.2	64.0	63.2	64.0	62.1	63.0	5785	66.0
1982	2987.5	910	38.2	52.2	38.2	52.2	37.5	51.3	3602	41.1
1983	5537.0	910	69.9	57.8	69.9	57.8	69.5	57.0	6237	71.2
1984	6617.0	910	86.2	64.6	86.2	64.6	82.8	63.2	7654	87.1
1985	6211.7	910	81.3	67.8	80.3	67.6	77.9	66.0	7218	82.4
1986	5725.5	910	74.8	68.9	73.4	68.6	71.8	67.0	6508	74.3
1987	4650.1	910	89.3	71.8	89.0	71.4	58.3	65.8	5895	67.3
1988	4289.0	910	57.6	70.0	57.0	69.6	53.7	64.3	5306	60.4
1989	5109.6	910	67.7	69.8	67.7	69.4	64.1	64.3	6224	71.1
1990	4463.6	910	61.3	68.9	59.2	68.4	56.0	63.4	5425	61.9
1991	5675.0	910	74.0	69.4	73.4	68.9	71.2	64.1	6619	75.6
1992	5834.7	910	84.0	70.6	80.7	69.8	73.0	64.9	7250	82.5
1993	5866.9	910	93.8	72.4	80.5	70.6	73.6	65.5	7794	89.0
1994	4657.7	910	68.6	72.1	67.7	70.4	58.4	65.0	5729	65.4
1995	6123.1	910	83.8	72.9	82.8	71.2	76.8	65.8	7461	85.2
1996	6089.2	910	83.5	73.5	80.3	71.8	76.2	66.4	7357	83.8
1997	5860.4	910	82.9	74.1	81.7	72.4	73.5	66.9	7236	82.6
1998	6321.4	910	87.1	74.8	83.7	73.0	79.3	67.5	7622	87.0
1999	5841.3	910	80.3	75.1	78.6	73.3	73.3	67.8	7116	81.2
2000	6531.9	910	88.2	75.7	88.1	74.0	81.7	68.5	7705	87.7
2001	5289.4	910	67.6	75.3	66.7	73.7	66.4	68.4	6034	68.9
2002	5769.3	910	88.6	75.9	86.3	74.3	72.4	68.6	7057	80.6

2003	5919.5	910	85.7	76.4	85.1	74.7	74.3	68.8	7420	84.7
2004	6213.9	910	86.4	76.8	86.2	75.2	77.7	69.2	7664	87.2
2005	6188.7	910	84.6	77.1	82.5	75.5	77.6	69.6	7400	84.5
2006	6244.4	910	84.9	77.4	82.8	75.8	78.3	69.9	7567	86.4
2007	6168.2	910	82.4	77.6	80.1	75.9	77.4	70.2	7312	83.5
2008	6716.7	910	91.8	78.1	89.1	76.4	84.0	70.7	8146	92.7
2009	5348.2	910	72.6	77.9	70.0	76.2	67.1	70.5	6527	74.5
2010	6334.9	910	82.7	78.0	82.0	76.4	79.5	70.8	7348	83.9
2011	4173.9	910	54.5	77.3	54.0	75.7	52.4	70.2	4827	55.1
2012	4856.1	910	62.4	76.8	61.4	75.2	60.8	69.9	5711	65.0
2013	5462.1	910	75.1	76.8	68.9	75.0	68.5	69.9	6283	71.7
2014	6111.9	910	83.3	77.0	82.6	75.2	76.7	70.1	7416	84.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		171			604	
B. Refuelling without a maintenance	936			49		
C. Inspection, maintenance or repair combined with refuelling				1039	13	
D. Inspection, maintenance or repair without refuelling	213			12	3	
E. Testing of plant systems or components				11	4	
H. Nuclear regulatory requirements					5	
J. Grid limitation, failure or grid unavailability			24			0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						9
L. Human factor related					13	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					0	16
Z. Other					41	2
Subtotal	1149	171	24	1111	683	28
Total		1344			1822	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		224
12. Reactor I&C Systems	27	8
13. Reactor Auxiliary Systems		16
14. Safety Systems		8
15. Reactor Cooling Systems		85
16. Steam generation systems		81
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		38
32. Feedwater and Main Steam System		53
33. Circulating Water System	144	4
35. All other I&C Systems		0
41. Main Generator Systems		12
42. Electrical Power Supply Systems		27
XX. Miscellaneous Systems		43
Total	171	599



## FR-21 GRAVELINES-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 910.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6274.4 GW(e)·h

Energy Availability Factor: 83.2%

Load Factor: 78.7%

Operating Factor: 83.5%

Energy Unavailability Factor: 16.8%

Total Off-line Time: 1442 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	670.8	604.0	664.1	635.2	586.5	291.9	0.0	205.1	623.8	663.0	650.8	679.1	6274.4
EAF (%)	99.3	99.3	99.0	98.2	87.6	44.7	0.0	75.6	97.8	98.7	99.6	100.0	83.2
UCF (%)	99.3	99.3	99.1	98.2	87.8	44.8	0.0	75.6	99.5	100.0	99.9	100.0	83.5
LF (%)	99.1	98.8	98.2	96.9	86.6	44.5	0.0	30.3	95.2	97.8	99.3	100.3	78.7
OF (%)	100.0	100.0	100.0	100.0	100.0	66.7	0.0	38.4	100.0	100.0	100.0	100.0	83.5
EUf (%)	0.7	0.7	1.0	1.8	12.4	55.3	100.0	24.4	2.2	1.3	0.4	0.0	16.8
PUf (%)	0.3	0.1	0.2	0.1	0.5	33.6	72.6	3.8	0.5	0.0	0.1	0.0	9.4
UCLF (%)	0.4	0.6	0.7	1.7	11.8	21.6	27.4	20.6	0.1	0.0	0.0	0.0	7.1
XUF (%)	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	1.7	1.3	0.3	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Mar 1975      Lifetime Generation: 200324.8 GW(e)·h

Date of First Criticality: 02 Aug 1980      Cumulative Energy Availability Factor: 78.3%

Date of Grid Connection: 26 Aug 1980      Cumulative Load Factor: 73.4%

Date of Commercial Operation: 01 Dec 1980      Cumulative Unit Capability Factor: 79.7%

Cumulative Energy Unavailability Factor: 21.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	515.0	914	74.7	74.7	74.7	74.7	75.2	75.2	571	76.7
1981	5949.2	920	81.2	80.7	81.2	80.7	73.8	73.9	7276	83.1
1982	2118.5	910	29.2	56.1	29.2	56.1	26.6	51.3	2732	31.2
1983	6130.0	910	77.9	63.2	77.9	63.2	76.9	59.6	6917	79.0
1984	5749.0	910	82.0	67.8	82.0	67.8	71.9	62.6	6751	76.9
1985	6829.7	910	90.2	72.2	89.7	72.1	85.7	67.1	7950	90.8
1986	6422.0	910	96.6	76.2	96.4	76.1	80.6	69.3	7956	90.8
1987	5357.9	910	77.4	76.4	75.2	75.9	67.2	69.0	6807	77.7
1988	5577.0	910	81.3	77.0	77.2	76.1	69.8	69.1	7227	82.3
1989	6412.9	910	84.6	77.8	83.6	76.9	80.4	70.4	7460	85.2
1990	6143.1	910	80.6	78.1	79.6	77.2	77.1	71.0	7164	81.8
1991	4915.9	910	63.6	76.8	63.0	75.9	61.7	70.2	5648	64.5
1992	6124.2	910	80.6	77.1	78.2	76.1	76.6	70.7	7149	81.4
1993	6219.9	910	82.3	77.5	79.3	76.3	78.0	71.3	7297	83.3
1994	6293.7	910	86.2	78.1	82.7	76.8	79.0	71.8	7638	87.2
1995	5599.7	910	75.6	77.9	74.6	76.6	70.2	71.7	6735	76.9
1996	5235.9	910	70.7	77.5	69.7	76.2	65.5	71.3	6361	72.4
1997	6641.2	910	98.0	78.7	97.8	77.5	83.3	72.0	8006	91.4
1998	5531.4	910	82.2	78.9	82.1	77.7	69.4	71.9	6896	78.7
1999	6394.4	910	87.8	79.3	85.3	78.1	80.2	72.3	7705	88.0
2000	5582.7	910	80.5	79.4	77.3	78.1	69.8	72.2	6952	79.1
2001	5984.5	910	85.5	79.7	85.0	78.4	75.1	72.3	7601	86.8
2002	5254.3	910	74.3	79.5	72.3	78.1	65.9	72.0	6658	76.0

2003	6553.9	910	89.6	79.9	89.2	78.6	82.2	72.5	7986	91.2
2004	6009.0	910	81.8	80.0	80.4	78.7	75.2	72.6	7262	82.7
2005	6622.6	910	88.2	80.3	86.6	79.0	83.1	73.0	7880	89.9
2006	6222.4	910	81.7	80.4	79.6	79.0	78.1	73.2	7369	84.1
2007	6522.6	910	88.0	80.6	86.4	79.3	81.8	73.5	7796	89.0
2008	6124.1	910	80.7	80.6	78.3	79.3	76.6	73.6	7271	82.8
2009	6537.4	910	86.5	80.8	84.5	79.4	82.0	73.9	7696	87.9
2010	5223.1	910	68.7	80.4	67.7	79.1	65.5	73.6	6149	70.2
2011	6861.9	910	87.5	80.7	86.4	79.3	86.1	74.0	7723	88.2
2012	5832.9	910	73.8	80.5	73.1	79.1	73.0	74.0	6776	77.1
2013	3895.3	910	51.9	79.6	49.0	78.2	48.9	73.2	4421	50.5
2014	6274.4	910	83.5	79.7	83.2	78.3	78.7	73.4	7318	83.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		353			270	
B. Refuelling without a maintenance	780			73		
C. Inspection, maintenance or repair combined with refuelling				981	36	
D. Inspection, maintenance or repair without refuelling				55		
E. Testing of plant systems or components				22		
H. Nuclear regulatory requirements					0	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			309			
L. Human factor related					9	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						7
Z. Other				17	51	46
Subtotal	780	353	309	1148	366	55
Total		1442			1569	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		19
13. Reactor Auxiliary Systems		12
14. Safety Systems		5
15. Reactor Cooling Systems		21
16. Steam generation systems		18
21. Fuel Handling and Storage Facilities		10
31. Turbine and auxiliaries	90	15
32. Feedwater and Main Steam System		22
33. Circulating Water System		3
35. All other I&C Systems		0
41. Main Generator Systems		32
42. Electrical Power Supply Systems		10
XX. Miscellaneous Systems	262	83
Total	352	262

## FR-27 GRAVELINES-3

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)  
 Design Net Capacity: 910.0 MW(e)  
 Design Discharge Burnup: 33735 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5818.4 GW(e)·h  
 Energy Availability Factor: 74.6%  
 Load Factor: 73.0%  
 Operating Factor: 76.4%  
 Energy Unavailability Factor: 25.4%  
 Total Off-line Time: 2066 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	644.5	611.4	668.0	471.7	520.1	633.2	631.7	21.4	0.0	394.7	648.5	573.3	5818.4
EAF (%)	99.9	100.0	100.0	74.3	77.4	97.8	93.3	3.2	0.0	58.2	99.1	94.1	74.6
UCF (%)	99.9	100.0	100.0	74.3	77.8	99.3	99.9	3.6	0.0	58.2	99.2	94.1	75.4
LF (%)	95.2	100.0	98.8	72.0	76.8	96.6	93.3	3.2	0.0	58.2	99.0	84.7	73.0
OF (%)	100.0	100.0	100.0	74.9	78.4	100.0	100.0	3.8	0.0	66.2	100.0	95.2	76.4
EUf (%)	0.1	0.0	0.0	25.7	22.6	2.2	6.7	96.8	100.0	41.8	0.9	5.9	25.4
PUF (%)	0.1	0.0	0.0	0.3	0.2	0.1	0.0	96.4	87.2	7.6	0.2	0.3	16.1
UCLF (%)	0.0	0.0	0.0	25.4	22.0	0.6	0.1	0.0	12.8	34.2	0.7	5.7	8.5
XUF (%)	0.0	0.0	0.0	0.0	0.4	1.5	6.6	0.4	0.0	0.0	0.1	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Dec 1975      Lifetime Generation: 197989.0 GW(e)·h  
 Date of First Criticality: 30 Nov 1980      Cumulative Energy Availability Factor: 77.6%  
 Date of Grid Connection: 12 Dec 1980      Cumulative Load Factor: 73.3%  
 Date of Commercial Operation: 01 Jun 1981      Cumulative Unit Capability Factor: 79.1%  
    Cumulative Energy Unavailability Factor: 22.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	3699.8	920	84.4	84.4	84.4	84.4	78.3	78.3	4462	86.9
1982	3445.0	910	47.6	61.3	47.6	61.3	43.2	56.3	4260	48.6
1983	6006.0	910	78.6	68.0	78.5	67.9	75.3	63.6	7194	82.1
1984	6746.0	910	83.9	72.4	83.9	72.4	84.4	69.4	7505	85.4
1985	6294.4	910	80.1	74.1	80.1	74.1	79.0	71.5	7151	81.6
1986	6504.5	910	81.7	75.5	81.7	75.4	81.6	73.3	7335	83.7
1987	5382.9	910	75.5	75.5	74.3	75.3	67.5	72.4	6188	70.6
1988	4819.0	910	96.2	78.2	95.4	77.9	60.3	70.8	6724	76.5
1989	6307.7	910	82.3	78.7	79.5	78.1	79.1	71.8	7320	83.6
1990	6121.5	910	80.6	78.9	77.6	78.1	76.8	72.3	7114	81.2
1991	6306.3	910	81.3	79.1	80.5	78.3	79.1	73.0	7086	80.9
1992	4772.4	910	60.4	77.5	60.0	76.7	59.7	71.8	5388	61.3
1993	6588.1	910	85.2	78.1	82.9	77.2	82.6	72.7	7567	86.4
1994	6308.9	910	83.8	78.5	83.0	77.6	79.1	73.1	7116	81.2
1995	6221.7	910	84.3	78.9	83.0	78.0	78.0	73.5	7326	83.6
1996	5937.2	910	85.9	79.4	83.0	78.3	74.3	73.5	7377	84.0
1997	5752.7	910	81.1	79.5	78.9	78.3	72.2	73.4	6938	79.2
1998	6152.4	910	83.9	79.7	83.0	78.6	77.2	73.7	7330	83.7
1999	5412.9	910	79.1	79.7	76.9	78.5	67.9	73.4	6709	76.6
2000	6112.4	910	84.6	79.9	82.9	78.7	76.5	73.5	7396	84.2
2001	6198.0	910	92.6	80.6	83.9	79.0	77.8	73.7	7597	86.7
2002	5282.5	910	76.8	80.4	76.8	78.9	66.3	73.4	6401	73.1
2003	6045.5	910	85.8	80.6	85.8	79.2	75.8	73.5	7482	85.4

2004	6393.1	910	83.9	80.8	83.8	79.4	80.0	73.8	7499	85.4
2005	6075.9	910	78.9	80.7	77.2	79.3	76.2	73.9	7126	81.3
2006	6501.2	910	86.7	80.9	85.7	79.5	81.6	74.2	7834	89.4
2007	6265.6	910	81.4	80.9	79.6	79.6	78.6	74.3	7267	82.9
2008	6027.1	910	78.6	80.9	76.5	79.4	75.4	74.4	7335	83.5
2009	5272.8	910	68.8	80.4	66.7	79.0	66.1	74.1	6303	72.0
2010	5689.3	910	73.2	80.2	71.7	78.7	71.4	74.0	6550	74.8
2011	6227.9	910	80.4	80.2	78.5	78.7	78.1	74.1	7117	81.2
2012	3423.4	910	44.5	79.1	43.1	77.6	42.8	73.1	4028	45.9
2013	6407.4	910	82.6	79.2	81.3	77.7	80.4	73.3	7268	83.0
2014	5818.4	910	75.4	79.1	74.6	77.6	73.0	73.3	6694	76.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		722			368	
B. Refuelling without a maintenance				105		
C. Inspection, maintenance or repair combined with refuelling	1344			994	22	
D. Inspection, maintenance or repair without refuelling				0		
E. Testing of plant systems or components				7	0	2
H. Nuclear regulatory requirements					2	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						6
L. Human factor related					10	1
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						2
Z. Other					43	52
Subtotal	1344	722	0	1106	445	63
Total		2066			1614	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems	36	19
13. Reactor Auxiliary Systems	10	20
14. Safety Systems	58	8
15. Reactor Cooling Systems	99	26
16. Steam generation systems		59
17. Safety I&C Systems (excluding reactor I&C)		5
21. Fuel Handling and Storage Facilities	77	8
31. Turbine and auxiliaries		20
32. Feedwater and Main Steam System	342	14
35. All other I&C Systems	13	0
41. Main Generator Systems		99
42. Electrical Power Supply Systems		23
XX. Miscellaneous Systems	86	51
Total	721	362

# FR-28 GRAVELINES-4

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 910.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4798.0 GW(e)·h

Energy Availability Factor: 59.7%

Load Factor: 60.2%

Operating Factor: 60.9%

Energy Unavailability Factor: 40.3%

Total Off-line Time: 3425 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	671.7	304.8	0.0	0.0	0.0	16.0	490.2	661.4	657.6	682.8	667.4	646.0	4798.0
EAF (%)	99.7	49.9	0.0	0.0	0.0	2.4	73.2	98.0	99.7	99.1	99.9	92.6	59.7
UCF (%)	99.7	49.9	0.0	0.0	0.0	12.5	73.5	98.6	100.0	99.9	100.0	92.6	60.7
LF (%)	99.2	49.8	0.0	0.0	0.0	2.4	72.4	97.7	100.4	100.7	101.9	95.4	60.2
OF (%)	100.0	50.0	0.0	0.0	0.0	7.1	77.4	98.8	100.0	100.0	100.0	95.2	60.9
EUAF (%)	0.3	50.1	100.0	100.0	100.0	97.6	26.8	2.0	0.3	0.9	0.1	7.4	40.3
PUF (%)	0.1	50.1	100.0	100.0	96.9	4.5	2.7	0.0	0.0	0.1	0.0	0.0	29.4
UCLF (%)	0.2	0.0	0.0	0.0	3.1	83.0	23.8	1.4	0.0	0.0	0.0	7.5	9.9
XUF (%)	0.0	0.0	0.0	0.0	0.0	10.0	0.3	0.6	0.3	0.8	0.1	0.0	1.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

BASE LOAD

## 5. Historical Summary

Date of Construction Start: 01 Apr 1976      Lifetime Generation: 200146.9 GW(e)·h

Date of First Criticality: 31 May 1981      Cumulative Energy Availability Factor: 79.0%

Date of Grid Connection: 14 Jun 1981      Cumulative Load Factor: 75.2%

Date of Commercial Operation: 01 Oct 1981      Cumulative Unit Capability Factor: 80.4%

Cumulative Energy Unavailability Factor: 21.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	1722.2	915	85.4	85.4	85.4	85.4	84.8	84.8	2031	92.0
1982	5498.2	910	80.8	81.7	80.8	81.7	69.0	72.2	7193	82.1
1983	4062.0	910	54.5	69.6	54.5	69.6	51.0	62.8	4986	56.9
1984	6006.0	910	82.8	73.7	82.8	73.7	75.1	66.6	7173	81.7
1985	6178.8	910	83.6	76.0	80.9	75.4	77.5	69.1	7387	84.3
1986	6556.6	910	88.7	78.4	88.6	77.9	82.2	71.6	7862	89.7
1987	5472.8	910	77.2	78.2	75.8	77.6	68.7	71.2	6787	77.5
1988	6221.0	910	87.9	79.6	85.9	78.7	77.8	72.1	7789	88.7
1989	4982.3	910	67.4	78.1	66.9	77.3	62.5	70.9	6025	68.8
1990	6151.7	910	79.4	78.2	77.2	77.3	77.2	71.6	7058	80.6
1991	6262.0	910	81.8	78.6	80.5	77.6	78.6	72.3	7067	80.7
1992	6419.8	910	81.0	78.8	80.2	77.8	80.3	73.0	7137	81.3
1993	4680.6	910	76.5	78.6	75.3	77.6	58.7	71.8	6112	69.8
1994	6039.3	910	83.3	79.0	82.5	78.0	75.8	72.1	6824	77.9
1995	6289.5	910	86.4	79.5	85.4	78.5	78.9	72.6	7313	83.5
1996	6288.4	910	85.5	79.9	83.2	78.8	78.7	73.0	7552	86.0
1997	5986.7	910	81.3	80.0	80.5	78.9	75.1	73.1	7206	82.3
1998	6519.3	910	85.4	80.3	84.1	79.2	81.8	73.6	7570	86.4
1999	5550.9	910	76.4	80.1	74.3	78.9	69.6	73.4	6734	76.9
2000	4563.6	910	69.5	79.5	57.7	77.8	57.1	72.6	5453	62.1
2001	5990.7	910	79.8	79.5	78.3	77.9	75.2	72.7	7094	81.0
2002	6028.1	910	81.1	79.6	80.0	78.0	75.6	72.8	7219	82.4
2003	5701.9	910	74.2	79.4	74.2	77.8	71.5	72.8	6589	75.2

2004	6544.6	910	85.4	79.6	85.4	78.1	81.9	73.2	7693	87.6
2005	6437.1	910	82.2	79.7	81.7	78.3	80.7	73.5	7354	83.9
2006	7123.1	910	91.5	80.2	89.9	78.7	89.4	74.1	8079	92.2
2007	6341.0	910	81.1	80.2	79.8	78.8	79.5	74.3	7164	81.8
2008	6663.0	910	85.8	80.4	85.0	79.0	83.4	74.6	7678	87.4
2009	6312.5	910	83.6	80.5	81.4	79.1	79.2	74.8	7342	83.8
2010	6785.7	910	89.1	80.8	88.5	79.4	85.1	75.2	7958	90.8
2011	6464.4	910	83.7	80.9	82.0	79.5	81.1	75.3	7383	84.3
2012	6669.7	910	84.9	81.1	83.9	79.6	83.4	75.6	7612	86.7
2013	6120.3	910	80.4	81.0	77.1	79.6	76.8	75.6	6967	79.5
2014	4798.0	910	60.7	80.4	59.7	79.0	60.2	75.2	5335	60.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		833			368	
B. Refuelling without a maintenance				77		
C. Inspection, maintenance or repair combined with refuelling	2521			956	8	
D. Inspection, maintenance or repair without refuelling				5	3	
E. Testing of plant systems or components				4	1	1
H. Nuclear regulatory requirements					8	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			72		0	8
Z. Other					21	26
Subtotal	2521	833	72	1042	413	37
Total		3426			1492	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	280	20
12. Reactor I&C Systems		46
13. Reactor Auxiliary Systems	190	3
14. Safety Systems		13
15. Reactor Cooling Systems		29
16. Steam generation systems		53
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries	41	27
32. Feedwater and Main Steam System		25
33. Circulating Water System		0
35. All other I&C Systems		8
41. Main Generator Systems		46
42. Electrical Power Supply Systems	275	55
XX. Miscellaneous Systems	45	34
Total	831	363

# FR-51 GRAVELINES-5

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 910.0 MW(e)

Design Discharge Burnup: 47000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6114.6 GW(e)·h

Energy Availability Factor: 77.2%

Load Factor: 76.7%

Operating Factor: 79.6%

Energy Unavailability Factor: 22.8%

Total Off-line Time: 1788 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	669.6	608.9	674.0	610.6	170.8	0.0	169.4	651.0	628.8	664.3	635.3	631.8	6114.6
EAF (%)	99.8	99.9	100.0	93.2	25.2	0.0	25.0	96.7	97.2	98.7	97.8	94.8	77.2
UCF (%)	99.8	99.9	100.0	98.1	28.8	0.0	25.0	97.6	98.8	99.9	98.1	94.8	78.3
LF (%)	98.9	99.6	99.7	93.2	25.2	0.0	25.0	96.2	96.0	98.0	97.0	93.3	76.7
OF (%)	100.0	100.0	100.0	100.0	29.0	0.0	32.0	100.0	100.0	100.0	100.0	95.4	79.6
EUf (%)	0.2	0.1	0.0	6.8	74.8	100.0	75.0	3.3	2.8	1.3	2.2	5.2	22.8
PUf (%)	0.0	0.1	0.0	0.0	71.2	100.0	53.9	1.8	0.0	0.0	0.1	0.0	19.0
UCLF (%)	0.2	0.1	0.0	1.9	0.0	0.0	21.1	0.6	1.2	0.1	1.9	5.2	2.7
XUF (%)	0.0	0.0	0.0	4.9	3.6	0.0	0.0	1.0	1.6	1.2	0.2	0.0	1.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 182043.5 GW(e)·h

Date of First Criticality: 05 Aug 1984      Cumulative Energy Availability Factor: 80.2%

Date of Grid Connection: 28 Aug 1984      Cumulative Load Factor: 75.7%

Date of Commercial Operation: 15 Jan 1985      Cumulative Unit Capability Factor: 81.9%

Cumulative Energy Unavailability Factor: 19.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	6768.4	910	90.1	90.1	90.0	90.0	84.9	84.9	7785	88.9
1986	5152.6	910	77.1	83.6	75.2	82.6	64.6	74.8	6673	76.2
1987	5236.5	910	81.5	82.9	80.6	82.0	65.7	71.7	6818	77.8
1988	4964.0	910	75.3	81.0	71.8	79.4	62.1	69.3	6306	71.8
1989	6020.6	910	81.0	81.0	80.6	79.7	75.5	70.6	7198	82.2
1990	5992.8	910	83.2	81.4	80.7	79.8	75.2	71.3	7367	84.1
1991	5276.2	910	72.2	80.0	69.6	78.4	66.2	70.6	6352	72.5
1992	6308.0	910	82.6	80.4	82.6	78.9	78.9	71.6	7361	83.8
1993	6180.5	910	82.7	80.6	78.6	78.9	77.5	72.3	7290	83.2
1994	5793.2	910	84.4	81.0	83.2	79.3	72.7	72.3	7147	81.6
1995	6181.0	910	87.6	81.6	86.0	79.9	77.5	72.8	7704	87.9
1996	5495.2	910	75.3	81.1	72.1	79.3	68.7	72.5	6652	75.7
1997	6429.9	910	87.6	81.6	86.1	79.8	80.7	73.1	7586	86.6
1998	6884.3	910	97.3	82.7	95.8	80.9	86.4	74.0	8286	94.6
1999	5124.3	910	68.1	81.7	67.0	80.0	64.3	73.4	6127	69.9
2000	5985.5	910	84.4	81.9	81.4	80.1	74.9	73.5	7444	84.7
2001	5762.6	910	80.2	81.8	78.2	80.0	72.3	73.4	6990	79.8
2002	6423.4	910	85.8	82.0	84.7	80.2	80.6	73.8	7662	87.5
2003	6473.4	910	85.1	82.2	84.3	80.5	81.2	74.2	7518	85.8
2004	6613.5	910	88.8	82.5	86.2	80.7	82.7	74.6	7836	89.2
2005	6410.0	910	84.0	82.6	81.7	80.8	80.4	74.9	7524	85.9
2006	5313.2	910	69.8	82.0	68.8	80.2	66.7	74.5	6313	72.1
2007	6510.2	910	85.4	82.2	83.5	80.4	81.7	74.8	7592	86.7

2008	6357.8	910	82.3	82.2	81.2	80.4	79.5	75.0	7352	83.7
2009	6652.2	910	88.3	82.4	85.5	80.6	83.4	75.4	7846	89.6
2010	6228.4	910	80.2	82.3	79.3	80.6	78.1	75.5	7120	81.3
2011	6859.2	910	88.5	82.5	87.0	80.8	86.0	75.9	7807	89.1
2012	5099.2	910	65.3	81.9	64.3	80.2	63.8	75.4	5943	67.7
2013	6635.0	910	84.2	82.0	83.5	80.3	83.2	75.7	7427	84.8
2014	6114.6	910	78.3	81.9	77.2	80.2	76.7	75.7	6972	79.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		190			365	
B. Refuelling without a maintenance				77		
C. Inspection, maintenance or repair combined with refuelling	1597			860	20	
D. Inspection, maintenance or repair without refuelling				2		
E. Testing of plant systems or components				2	0	
H. Nuclear regulatory requirements					1	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					17	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						0
Z. Other					16	
Subtotal	1597	190	0	941	419	2
Total		1787			1362	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems		14
13. Reactor Auxiliary Systems		28
14. Safety Systems	34	0
15. Reactor Cooling Systems		72
16. Steam generation systems		8
21. Fuel Handling and Storage Facilities		5
31. Turbine and auxiliaries		31
32. Feedwater and Main Steam System		17
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems	118	56
42. Electrical Power Supply Systems		56
XX. Miscellaneous Systems	38	51
Total	190	358



## FR-52 GRAVELINES-6

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 910.0 MW(e)

Design Net Capacity: 910.0 MW(e)

Design Discharge Burnup: 47000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5768.1 GW(e)·h

Energy Availability Factor: 74.9%

Load Factor: 72.4%

Operating Factor: 75.6%

Energy Unavailability Factor: 25.1%

Total Off-line Time: 2141 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	691.3	618.3	689.6	281.9	509.4	549.9	608.6	618.1	399.6	0.0	219.8	581.8	5768.1
EAF (%)	100.0	98.9	100.0	42.3	75.4	91.4	98.3	98.1	62.2	0.0	33.2	99.7	74.9
UCF (%)	100.0	98.9	100.0	42.3	75.5	91.8	99.9	99.8	62.8	0.0	33.2	99.7	75.3
LF (%)	102.1	101.1	102.0	43.0	75.2	83.9	89.9	91.3	61.0	0.0	33.5	85.9	72.4
OF (%)	100.0	100.0	100.0	42.6	78.8	88.1	100.0	100.0	63.3	0.0	40.7	93.5	75.6
EUF (%)	0.0	1.1	0.0	57.7	24.6	8.6	1.7	1.9	37.8	100.0	66.8	0.3	25.1
PUF (%)	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	36.9	100.0	66.8	0.1	17.1
UCLF (%)	0.0	1.0	0.0	57.7	24.6	8.2	0.0	0.2	0.4	0.0	0.0	0.2	7.6
XUF (%)	0.0	0.0	0.0	0.0	0.1	0.3	1.6	1.8	0.6	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 181082.9 GW(e)·h

Date of First Criticality: 21 Jul 1985      Cumulative Energy Availability Factor: 80.3%

Date of Grid Connection: 01 Aug 1985      Cumulative Load Factor: 77.4%

Date of Commercial Operation: 25 Oct 1985      Cumulative Unit Capability Factor: 81.6%

Cumulative Energy Unavailability Factor: 19.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	1740.9	910	88.7	88.7	88.6	88.6	86.6	86.6	2003	90.7
1986	5540.4	910	76.3	78.8	75.9	78.4	69.5	73.0	6677	76.2
1987	5583.9	910	80.6	79.6	80.1	79.2	70.0	71.7	7031	80.3
1988	6490.0	910	83.8	80.9	81.4	79.9	81.2	74.6	7453	84.8
1989	5177.3	910	71.2	78.6	71.1	77.8	64.9	72.3	6274	71.6
1990	6120.3	910	87.6	80.3	87.1	79.6	76.8	73.2	7553	86.2
1991	5888.2	910	78.5	80.0	77.5	79.2	73.9	73.3	6953	79.4
1992	5085.1	910	70.3	78.7	69.0	77.8	63.6	71.9	6246	71.1
1993	5293.6	910	82.0	79.1	73.4	77.3	66.4	71.3	6751	77.1
1994	6053.7	910	86.0	79.8	83.9	78.0	75.9	71.8	7487	85.5
1995	6769.4	910	89.8	80.8	88.8	79.1	84.9	73.1	7922	90.4
1996	6609.5	910	86.8	81.3	86.4	79.7	82.7	73.9	7755	88.3
1997	4545.4	910	60.6	79.6	59.5	78.1	57.0	72.5	5437	62.1
1998	6531.8	910	88.5	80.3	86.1	78.7	81.9	73.3	7746	88.4
1999	6141.4	910	80.9	80.4	80.3	78.8	77.0	73.5	7222	82.4
2000	6720.9	910	88.7	80.9	87.0	79.3	84.1	74.2	7887	89.8
2001	6148.7	910	82.2	81.0	80.2	79.4	77.1	74.4	7265	82.9
2002	6690.9	910	87.5	81.4	86.0	79.8	83.9	74.9	7784	88.9
2003	6462.6	910	83.3	81.5	82.5	79.9	81.1	75.3	7410	84.6
2004	6936.1	910	88.3	81.8	86.9	80.3	86.8	75.9	7850	89.4
2005	6536.5	910	84.3	81.9	82.4	80.4	82.0	76.2	7511	85.7
2006	7058.4	910	89.3	82.3	88.3	80.7	88.5	76.8	7907	90.3
2007	5455.7	910	69.1	81.7	68.4	80.2	68.4	76.4	6087	69.5

2008	5792.8	910	71.5	81.3	71.5	79.8	72.5	76.2	6383	72.7
2009	7108.2	910	89.0	81.6	89.0	80.2	89.2	76.8	7866	89.8
2010	6363.9	910	80.9	81.5	80.1	80.2	79.8	76.9	7125	81.3
2011	7101.9	910	89.5	81.9	89.2	80.5	89.1	77.3	7859	89.7
2012	6115.2	910	77.0	81.7	76.3	80.4	76.5	77.3	6810	77.5
2013	6773.0	910	84.5	81.8	84.3	80.5	85.0	77.6	7544	86.1
2014	5768.1	910	75.3	81.6	74.9	80.3	72.4	77.4	6619	75.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		487			347	
B. Refuelling without a maintenance				90		
C. Inspection, maintenance or repair combined with refuelling	1435			850	24	
D. Inspection, maintenance or repair without refuelling					17	
E. Testing of plant systems or components				9		
H. Nuclear regulatory requirements					4	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			82			0
L. Human factor related		140			9	0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					3	3
Z. Other					41	1
Subtotal	1435	627	82	949	445	5
Total		2144			1399	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems	353	23
13. Reactor Auxiliary Systems		69
14. Safety Systems		13
15. Reactor Cooling Systems		28
16. Steam generation systems		6
21. Fuel Handling and Storage Facilities	4	5
31. Turbine and auxiliaries		68
32. Feedwater and Main Steam System		17
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems		17
42. Electrical Power Supply Systems		43
XX. Miscellaneous Systems	129	51
Total	486	342

# FR-58 NOGENT-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1310.0 MW(e)

Design Net Capacity: 1310.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8980.0 GW(e)·h

Energy Availability Factor: 83.3%

Load Factor: 78.3%

Operating Factor: 89.3%

Energy Unavailability Factor: 16.7%

Total Off-line Time: 934 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	639.0	747.4	563.0	0.0	628.2	878.3	904.4	914.7	900.2	940.6	913.9	950.2	8980.0
EAF (%)	98.6	84.9	57.9	0.0	64.4	98.7	99.6	99.4	99.1	99.0	98.7	98.3	83.3
UCF (%)	100.0	100.0	99.9	0.0	64.4	98.7	99.6	99.4	99.1	99.3	98.7	98.3	88.2
LF (%)	65.6	84.9	57.8	0.0	64.5	93.1	92.8	93.9	95.4	96.4	96.9	97.5	78.3
OF (%)	95.6	100.0	100.0	0.1	75.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.3
EUf (%)	1.4	15.1	42.1	100.0	35.6	1.3	0.4	0.6	0.9	1.0	1.3	1.7	16.7
PUF (%)	0.0	0.0	0.1	100.0	29.4	0.0	0.1	0.0	0.1	0.0	0.1	0.0	10.8
UCLF (%)	0.0	0.0	0.0	0.0	6.2	1.3	0.3	0.6	0.9	0.7	1.3	1.7	1.1
XUF (%)	1.4	15.1	42.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	4.9

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

BASE LOAD

## 5. Historical Summary

Date of Construction Start: 26 May 1981      Lifetime Generation: 223387.6 GW(e)·h

Date of First Criticality: 12 Sep 1987      Cumulative Energy Availability Factor: 77.6%

Date of Grid Connection: 21 Oct 1987      Cumulative Load Factor: 72.0%

Date of Commercial Operation: 24 Feb 1988      Cumulative Unit Capability Factor: 79.7%

Cumulative Energy Unavailability Factor: 22.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	7028.0	1310	88.5	88.5	87.6	87.6	66.7	66.7	6701	83.3
1989	3172.7	1310	30.2	58.1	28.3	56.7	27.6	46.3	2663	30.4
1990	6614.1	1310	67.7	61.4	67.5	60.4	57.6	50.2	5590	63.8
1991	6868.6	1310	64.2	62.1	62.9	61.0	59.9	52.7	5768	65.8
1992	7812.5	1310	71.5	64.0	70.4	62.9	67.9	55.8	6386	72.7
1993	7705.6	1310	72.2	65.4	68.5	63.9	67.1	57.7	6432	73.4
1994	8292.3	1310	83.2	68.0	80.1	66.2	72.3	59.8	7429	84.8
1995	7358.3	1310	84.3	70.0	83.9	68.5	64.1	60.3	6946	79.3
1996	8227.9	1310	81.1	71.3	79.6	69.7	71.5	61.6	7222	82.2
1997	8571.6	1310	83.7	72.5	81.1	70.9	74.7	62.9	7488	85.5
1998	6585.5	1310	59.2	71.3	57.2	69.6	57.4	62.4	5334	60.9
1999	9705.0	1310	92.5	73.1	91.8	71.5	84.6	64.3	8284	94.6
2000	9088.3	1310	85.2	74.0	83.0	72.4	79.0	65.4	7626	86.8
2001	9142.7	1310	84.7	74.8	83.8	73.2	79.7	66.4	7580	86.5
2002	9011.0	1310	87.3	75.6	87.1	74.1	78.5	67.2	7738	88.3
2003	9974.4	1310	98.3	77.0	98.0	75.6	86.9	68.5	8621	98.4
2004	8535.3	1310	81.0	77.3	77.8	75.7	74.2	68.8	7152	81.4
2005	8534.4	1310	76.5	77.2	75.1	75.7	74.4	69.1	6803	77.7
2006	9284.8	1310	82.9	77.5	82.9	76.1	80.9	69.8	7331	83.7
2007	10831.8	1310	96.5	78.5	94.5	77.0	94.4	71.0	8484	96.8
2008	8553.3	1310	78.0	78.5	74.9	76.9	74.3	71.1	7052	80.3
2009	7309.0	1310	73.8	78.3	64.7	76.4	63.7	70.8	5871	67.0
2010	10382.4	1310	97.2	79.1	96.4	77.2	90.5	71.7	8482	96.8

2011	9001.4	1310	86.9	79.4	84.8	77.5	78.4	71.9	7562	86.3
2012	6457.0	1310	60.0	78.6	57.7	76.7	56.1	71.3	5429	61.8
2013	9487.6	1310	99.4	79.4	93.0	77.4	82.7	71.7	8116	92.6
2014	8980.0	1310	88.2	79.7	83.3	77.6	78.3	72.0	7826	89.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		24			504	
B. Refuelling without a maintenance	864					
C. Inspection, maintenance or repair combined with refuelling				888	1	
D. Inspection, maintenance or repair without refuelling				62		
E. Testing of plant systems or components				54		1
H. Nuclear regulatory requirements					12	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			34			
L. Human factor related		12			51	1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						41
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						14
Z. Other					7	1
Subtotal	864	36	34	1004	575	58
Total		934			1637	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		59
12. Reactor I&C Systems	13	42
13. Reactor Auxiliary Systems		1
14. Safety Systems		0
15. Reactor Cooling Systems		22
16. Steam generation systems		92
17. Safety I&C Systems (excluding reactor I&C)		12
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries		56
32. Feedwater and Main Steam System		14
33. Circulating Water System		60
35. All other I&C Systems		1
41. Main Generator Systems		94
42. Electrical Power Supply Systems		18
XX. Miscellaneous Systems	11	21
Total	24	498

## FR-59 NOGENT-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1310.0 MW(e)  
 Design Net Capacity: 1310.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7715.4 GW(e)·h  
 Energy Availability Factor: 85.0%  
 Load Factor: 67.2%  
 Operating Factor: 75.2%  
 Energy Unavailability Factor: 15.0%  
 Total Off-line Time: 2176 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	901.2	515.5	0.0	744.5	819.6	618.3	473.6	186.1	821.4	890.5	784.0	960.7	7715.4
EAF (%)	99.4	59.3	0.0	78.9	98.2	100.0	97.0	100.0	100.0	100.0	85.9	99.4	85.0
UCF (%)	99.4	59.3	0.0	78.9	98.2	100.0	97.0	100.0	100.0	100.0	85.9	99.4	85.0
LF (%)	92.5	58.6	0.0	78.9	84.1	65.5	48.6	19.1	87.1	91.2	83.1	98.6	67.2
OF (%)	95.8	62.4	0.0	86.8	100.0	85.1	63.4	22.6	100.0	100.0	86.3	100.0	75.2
EUf (%)	0.6	40.7	100.0	21.1	1.8	0.0	3.0	0.0	0.0	0.0	14.1	0.6	15.0
PUf (%)	0.0	25.5	85.4	7.7	1.8	0.0	0.0	0.0	0.0	0.0	5.0	0.0	10.4
UCLF (%)	0.6	15.2	14.6	13.4	0.0	0.0	3.0	0.0	0.0	0.0	9.1	0.6	4.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Jan 1982      Lifetime Generation: 220978.2 GW(e)·h  
 Date of First Criticality: 04 Oct 1988      Cumulative Energy Availability Factor: 80.8%  
 Date of Grid Connection: 14 Dec 1988      Cumulative Load Factor: 74.4%  
 Date of Commercial Operation: 01 May 1989      Cumulative Unit Capability Factor: 82.6%  
    Cumulative Energy Unavailability Factor: 19.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	5612.0	1310	78.9	78.9	78.9	78.9	72.8	72.8	4744	80.7
1990	7532.9	1310	69.4	73.2	68.3	72.6	65.6	68.5	6094	69.6
1991	8331.1	1310	78.8	75.3	73.5	72.9	72.6	70.1	7008	80.0
1992	8312.3	1310	77.4	75.9	74.1	73.2	72.2	70.7	6937	79.0
1993	9191.7	1310	85.9	78.0	80.8	74.8	80.1	72.7	7594	86.7
1994	6483.0	1310	98.0	81.5	94.8	78.4	56.5	69.8	6027	68.8
1995	7545.4	1310	78.4	81.1	75.9	78.0	65.8	69.2	6862	78.3
1996	8477.0	1310	80.5	81.0	77.0	77.9	73.7	69.8	7229	82.3
1997	8925.8	1310	86.0	81.6	82.0	78.3	77.8	70.7	7656	87.4
1998	8830.0	1310	98.0	83.3	97.8	80.3	76.9	71.4	7386	84.3
1999	7957.3	1310	76.2	82.6	74.7	79.8	69.3	71.2	6732	76.8
2000	9672.1	1310	85.9	82.9	84.6	80.2	84.1	72.3	7654	87.1
2001	9379.0	1310	85.1	83.1	83.4	80.5	81.7	73.0	7589	86.6
2002	8205.5	1310	84.2	83.2	84.2	80.7	71.5	72.9	7241	82.7
2003	9447.1	1310	91.5	83.7	91.5	81.5	82.3	73.6	7954	90.8
2004	8216.7	1310	78.6	83.4	75.1	81.1	71.4	73.4	7044	80.2
2005	8393.3	1310	77.2	83.0	76.1	80.8	73.1	73.4	6907	78.8
2006	10046.5	1310	89.5	83.4	89.5	81.3	87.5	74.2	7854	89.7
2007	9885.9	1310	89.5	83.7	86.9	81.6	86.1	74.8	7918	90.4
2008	7594.2	1310	68.8	83.0	67.0	80.8	66.0	74.4	6175	70.3
2009	7156.4	1310	67.3	82.2	66.0	80.1	62.4	73.8	6227	71.1
2010	8055.2	1310	73.7	81.8	73.7	79.8	70.2	73.6	6576	75.1
2011	9424.4	1310	84.7	81.9	84.5	80.0	82.1	74.0	7468	85.3

2012	9853.2	1310	91.2	82.3	89.0	80.4	85.6	74.5	7964	90.7
2013	9162.0	1310	86.8	82.5	85.6	80.6	79.8	74.7	7595	86.7
2014	7715.4	1310	85.0	82.6	85.0	80.8	67.2	74.4	6584	75.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		303			392	
B. Refuelling without a maintenance	803					
C. Inspection, maintenance or repair combined with refuelling				846		
E. Testing of plant systems or components	35			20		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			987			
L. Human factor related		60			6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						3
Z. Other					41	
Subtotal	838	363	987	866	439	5
Total		2188			1310	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems	110	23
13. Reactor Auxiliary Systems		10
14. Safety Systems		28
15. Reactor Cooling Systems	4	21
16. Steam generation systems		31
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities	62	19
31. Turbine and auxiliaries	8	18
32. Feedwater and Main Steam System		8
33. Circulating Water System		32
35. All other I&C Systems		6
41. Main Generator Systems	56	162
42. Electrical Power Supply Systems		6
XX. Miscellaneous Systems	61	5
Total	301	385

**FR-36 PALUEL-1****Operator:** EDF (Electricite de France)**Contractor:** FRAM (FRAMATOME)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1330.0 MW(e)

**Design Net Capacity:** 1330.0 MW(e)

**Design Discharge Burnup:** 33000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 9615.9 GW(e)·h

**Energy Availability Factor:** 84.4%

**Load Factor:** 82.5%

**Operating Factor:** 86.4%

**Energy Unavailability Factor:** 15.6%

**Total Off-line Time:** 1193 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	969.4	878.5	968.2	727.5	959.7	925.2	944.7	947.6	755.0	521.4	118.2	900.4	9615.9
<b>EAF (%)</b>	99.8	100.0	100.0	78.2	99.5	99.1	98.3	98.1	81.1	54.1	12.3	91.8	84.4
<b>UCF (%)</b>	99.8	100.0	100.0	78.2	99.7	100.0	99.9	99.9	82.2	54.7	15.7	91.8	85.2
<b>LF (%)</b>	98.0	98.3	98.0	76.0	97.0	96.6	95.5	95.8	78.8	52.6	12.3	91.0	82.5
<b>OF (%)</b>	100.0	100.0	100.0	80.1	100.0	100.0	100.0	100.0	82.8	55.0	18.9	99.1	86.4
<b>EUf (%)</b>	0.2	0.0	0.0	21.8	0.5	0.9	1.7	1.9	18.9	45.9	87.7	8.2	15.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	45.3	70.2	1.9	9.8
<b>UCLF (%)</b>	0.2	0.0	0.0	21.8	0.3	0.0	0.0	0.0	17.6	0.0	14.1	6.3	5.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.2	0.9	1.6	1.8	1.1	0.6	3.3	0.0	0.8

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

LOAD FOLLOWING

**5. Historical Summary**

**Date of Construction Start:** 15 Aug 1977 **Lifetime Generation:** 247247.8 GW(e)·h

**Date of First Criticality:** 13 May 1984 **Cumulative Energy Availability Factor:** 76.8%

**Date of Grid Connection:** 22 Jun 1984 **Cumulative Load Factor:** 71.5%

**Date of Commercial Operation:** 01 Dec 1985 **Cumulative Unit Capability Factor:** 79.1%

**Cumulative Energy Unavailability Factor:** 23.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	947.5	1290	94.9	94.9	94.9	94.9	98.7	98.7	731	98.3
1986	5169.7	1290	52.3	55.7	50.2	53.7	45.7	49.9	4455	50.9
1987	8184.8	1330	77.0	66.0	76.6	64.9	70.3	59.8	6527	74.5
1988	9291.0	1330	96.8	76.1	95.3	74.8	79.5	66.3	7332	83.5
1989	7902.8	1330	72.6	75.3	70.4	73.7	67.8	66.7	6567	75.0
1990	7323.9	1330	70.1	74.2	66.4	72.3	62.9	65.9	6288	71.8
1991	7159.9	1330	66.7	73.0	63.2	70.8	61.5	65.2	5987	68.3
1992	8640.4	1330	76.6	73.5	76.6	71.6	74.0	66.4	6858	78.1
1993	8068.1	1330	77.2	74.0	70.9	71.5	69.2	66.8	6906	78.8
1994	6549.9	1330	77.1	74.3	76.9	72.1	56.2	65.6	5790	66.1
1995	8768.2	1330	82.2	75.1	79.6	72.9	75.3	66.6	7292	83.2
1996	5483.2	1330	52.7	73.1	48.7	70.7	46.9	64.8	4763	54.2
1997	9019.7	1330	84.5	74.0	83.8	71.8	77.4	65.8	7537	86.0
1998	9718.1	1330	91.3	75.3	91.2	73.3	83.4	67.2	8132	92.8
1999	8181.9	1330	78.6	75.6	76.2	73.5	70.2	67.4	6938	79.2
2000	9089.0	1330	84.0	76.1	83.5	74.1	77.8	68.1	7533	85.8
2001	9752.2	1330	98.3	77.5	97.6	75.6	83.7	69.1	8382	95.7
2002	7153.9	1330	68.3	77.0	66.6	75.1	61.4	68.6	6081	69.4
2003	8526.2	1330	77.6	77.0	77.2	75.2	73.2	68.9	6882	78.6
2004	8596.3	1330	79.4	77.1	77.4	75.3	73.6	69.1	7103	80.9
2005	10565.5	1330	98.4	78.2	97.9	76.4	90.7	70.2	8654	98.8
2006	7437.7	1330	68.6	77.7	66.0	75.9	63.8	69.9	6133	70.0
2007	8135.1	1330	75.1	77.6	73.3	75.8	69.8	69.9	6641	75.8

2008	9808.7	1330	91.1	78.2	90.3	76.4	84.0	70.5	8116	92.4
2009	7469.3	1330	86.1	78.5	66.5	76.0	64.1	70.2	6108	69.7
2010	8295.2	1330	77.2	78.5	74.6	76.0	71.2	70.3	6661	76.0
2011	10184.1	1330	95.0	79.1	94.3	76.7	87.4	70.9	8349	95.3
2012	9140.9	1330	82.6	79.2	80.6	76.8	78.2	71.2	7351	83.7
2013	7888.1	1330	70.6	78.9	69.2	76.5	67.7	71.1	6203	70.8
2014	9615.9	1330	85.2	79.1	84.4	76.8	82.5	71.5	7567	86.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		374			388	2
B. Refuelling without a maintenance	791			21		
C. Inspection, maintenance or repair combined with refuelling				958	45	
D. Inspection, maintenance or repair without refuelling				116		
E. Testing of plant systems or components				21	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				11		
H. Nuclear regulatory requirements					12	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					34	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			24			56
Z. Other					75	
Subtotal	791	374	24	1127	554	59
Total		1189			1740	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems	55	43
13. Reactor Auxiliary Systems		30
14. Safety Systems		2
15. Reactor Cooling Systems		12
16. Steam generation systems	107	12
21. Fuel Handling and Storage Facilities		10
31. Turbine and auxiliaries	7	37
32. Feedwater and Main Steam System		29
33. Circulating Water System		16
35. All other I&C Systems	13	1
41. Main Generator Systems		110
42. Electrical Power Supply Systems	123	11
XX. Miscellaneous Systems	67	52
Total	372	384



## FR-37 PALUEL-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1330.0 MW(e)

Design Net Capacity: 1330.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 9113.0 GW(e)·h

Energy Availability Factor: 83.7%

Load Factor: 78.2%

Operating Factor: 85.6%

Energy Unavailability Factor: 16.3%

Total Off-line Time: 1261 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	949.5	703.8	0.3	414.4	931.5	861.0	821.5	818.8	852.1	926.2	894.5	939.5	9113.0
EAF (%)	97.7	78.7	0.0	44.0	99.7	98.0	93.1	98.3	95.8	99.1	99.6	99.3	83.7
UCF (%)	100.0	90.0	0.0	44.0	99.8	99.5	93.8	99.0	96.8	99.9	100.0	99.7	85.2
LF (%)	96.0	78.7	0.0	43.3	94.1	89.9	83.0	82.8	89.0	93.5	93.4	94.9	78.2
OF (%)	100.0	92.3	0.3	49.9	100.0	97.1	94.5	96.8	97.1	100.0	100.0	100.0	85.6
EUf (%)	2.3	21.3	100.0	56.0	0.3	2.0	6.9	1.7	4.2	0.9	0.4	0.7	16.3
PUf (%)	0.0	0.0	100.0	26.2	0.2	0.1	0.0	0.1	0.0	0.1	0.0	0.3	10.7
UCLF (%)	0.0	10.0	0.0	29.9	0.0	0.4	6.3	1.0	3.2	0.0	0.0	0.0	4.1
XUF (%)	2.3	11.2	0.0	0.0	0.2	1.5	0.6	0.7	0.9	0.8	0.4	0.4	1.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

BASE LOAD

### 5. Historical Summary

Date of Construction Start: 01 Jan 1978      Lifetime Generation: 243921.7 GW(e)·h

Date of First Criticality: 11 Aug 1984      Cumulative Energy Availability Factor: 75.9%

Date of Grid Connection: 14 Sep 1984      Cumulative Load Factor: 70.4%

Date of Commercial Operation: 01 Dec 1985      Cumulative Unit Capability Factor: 78.0%

Cumulative Energy Unavailability Factor: 24.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	990.5	1290	99.6	99.6	99.6	99.6	103.2	103.2	744	100.0
1986	6040.9	1290	52.3	56.0	52.2	55.9	53.5	57.4	4804	54.8
1987	8859.6	1290	77.3	66.2	76.8	66.0	78.4	67.4	6837	78.0
1988	7725.0	1330	75.5	69.3	73.5	68.5	66.1	67.0	6017	68.5
1989	8956.4	1330	83.4	72.8	80.1	71.3	76.9	69.5	7358	84.0
1990	6496.3	1330	59.1	70.1	59.1	68.9	55.8	66.7	5328	60.8
1991	6140.3	1330	55.1	67.6	54.9	66.6	52.7	64.4	4996	57.0
1992	6906.9	1330	63.6	67.0	61.7	65.9	59.1	63.7	5618	64.0
1993	7954.4	1330	87.9	69.6	76.9	67.3	68.3	64.2	7217	82.4
1994	7115.2	1330	77.6	70.5	74.5	68.1	61.1	63.9	6671	76.2
1995	6934.5	1330	70.5	70.5	65.8	67.8	59.5	63.4	6252	71.4
1996	8407.4	1330	83.8	71.7	78.5	68.8	72.0	64.2	7195	81.9
1997	8139.8	1330	83.9	72.7	83.5	70.0	69.9	64.7	7182	82.0
1998	7300.4	1330	73.1	72.8	69.1	70.0	62.7	64.5	6583	75.1
1999	9243.8	1330	85.6	73.7	84.1	71.0	79.3	65.6	7705	88.0
2000	9849.9	1330	96.0	75.2	94.4	72.5	84.3	66.8	8271	94.2
2001	7843.1	1330	76.7	75.3	76.0	72.7	67.3	66.9	6861	78.3
2002	7984.4	1330	73.2	75.1	72.0	72.7	68.5	67.0	6569	75.0
2003	8814.9	1330	82.1	75.5	81.1	73.2	75.7	67.4	7490	85.5
2004	9562.7	1330	92.6	76.4	89.9	74.1	81.9	68.2	8039	91.5
2005	7246.4	1330	65.3	75.9	64.5	73.6	62.2	67.9	5823	66.5
2006	8143.5	1330	74.4	75.8	73.9	73.6	69.9	68.0	6673	76.2
2007	7558.0	1330	68.3	75.5	66.8	73.3	64.9	67.9	6021	68.7

2008	9315.6	1330	85.1	75.9	84.0	73.7	79.7	68.4	7595	86.5
2009	8393.4	1330	78.8	76.0	75.0	73.8	72.0	68.5	6815	77.8
2010	10210.0	1330	96.9	76.8	96.0	74.7	87.6	69.3	8496	97.0
2011	8869.0	1330	87.7	77.2	84.6	75.1	76.1	69.6	7697	87.9
2012	7298.4	1330	69.0	76.9	67.3	74.8	62.5	69.3	6084	69.3
2013	10778.9	1330	98.9	77.7	97.7	75.6	92.5	70.1	8675	99.0
2014	9113.0	1330	85.2	78.0	83.7	75.9	78.2	70.4	7499	85.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		331			599	2
B. Refuelling without a maintenance	887			73		
C. Inspection, maintenance or repair combined with refuelling				840	93	
D. Inspection, maintenance or repair without refuelling				37	7	
E. Testing of plant systems or components				16	1	
H. Nuclear regulatory requirements					8	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			42			0
L. Human factor related					10	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						5
Z. Other					36	0
Subtotal	887	331	42	966	754	8
Total		1260			1728	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		17
12. Reactor I&C Systems	51	86
13. Reactor Auxiliary Systems		7
14. Safety Systems		23
15. Reactor Cooling Systems		65
16. Steam generation systems		27
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries	19	41
32. Feedwater and Main Steam System	21	7
33. Circulating Water System		51
35. All other I&C Systems	24	1
41. Main Generator Systems		190
42. Electrical Power Supply Systems		32
XX. Miscellaneous Systems	214	42
Total	329	595

**FR-38 PALUEL-3****Operator:** EDF (Electricite de France)**Contractor:** FRAM (FRAMATOME)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1330.0 MW(e)

**Design Net Capacity:** 1330.0 MW(e)

**Design Discharge Burnup:** 33000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 10592.9 GW(e)·h

**Energy Availability Factor:** 93.8%

**Load Factor:** 90.9%

**Operating Factor:** 96.6%

**Energy Unavailability Factor:** 6.2%

**Total Off-line Time:** 300 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	966.5	866.6	955.5	919.3	779.6	813.2	842.7	804.9	917.0	954.1	931.6	841.9	10592.9
<b>EAF (%)</b>	99.8	99.9	99.8	99.6	82.2	87.9	90.8	84.2	98.6	98.4	99.1	86.4	93.8
<b>UCF (%)</b>	99.8	99.9	99.8	99.6	85.5	92.5	91.8	84.5	99.8	99.4	99.6	86.4	94.8
<b>LF (%)</b>	97.7	97.0	96.7	96.0	78.8	84.9	85.2	81.3	95.8	96.3	97.3	85.1	90.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	95.8	93.8	92.6	89.4	100.0	100.0	100.0	87.9	96.6
<b>EUf (%)</b>	0.2	0.1	0.2	0.4	17.8	12.1	9.2	15.8	1.4	1.6	0.9	13.6	6.2
<b>PUf (%)</b>	0.2	0.1	0.0	0.3	0.0	0.1	0.0	0.1	0.1	0.6	0.4	0.1	0.2
<b>UCLF (%)</b>	0.0	0.0	0.2	0.2	14.4	7.5	8.2	15.5	0.1	0.0	0.0	13.5	5.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	3.4	4.6	1.0	0.2	1.2	1.0	0.5	0.0	1.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

LOAD FOLLOWING

**5. Historical Summary**

**Date of Construction Start:** 01 Feb 1979      **Lifetime Generation:** 233130.2 GW(e)·h

**Date of First Criticality:** 07 Aug 1985      **Cumulative Energy Availability Factor:** 73.4%

**Date of Grid Connection:** 30 Sep 1985      **Cumulative Load Factor:** 68.7%

**Date of Commercial Operation:** 01 Feb 1986      **Cumulative Unit Capability Factor:** 75.1%

**Cumulative Energy Unavailability Factor:** 26.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	7395.7	1290	72.1	72.1	72.1	72.1	71.5	71.5	5759	71.8
1987	7716.6	1290	78.4	75.4	78.3	75.3	68.3	69.8	6104	69.7
1988	6763.0	1330	68.7	73.0	59.2	69.7	57.9	65.6	5413	61.6
1989	8124.4	1330	70.7	72.4	70.2	69.8	69.7	66.7	6288	71.8
1990	7322.0	1330	67.2	71.4	66.2	69.1	62.8	65.9	6008	68.6
1991	9587.1	1330	86.5	73.9	86.3	72.0	82.3	68.7	7634	87.1
1992	6886.6	1330	63.2	72.4	63.0	70.7	58.9	67.3	5671	64.6
1993	8459.0	1330	77.5	73.0	73.4	71.0	72.6	68.0	6951	79.3
1994	6703.6	1330	63.4	71.9	61.8	70.0	57.5	66.8	5590	63.8
1995	8733.3	1330	85.6	73.3	84.1	71.4	75.0	67.6	7598	86.7
1996	8027.7	1330	84.9	74.4	84.6	72.6	68.7	67.7	7261	82.7
1997	7618.8	1330	73.2	74.3	72.8	72.6	65.4	67.5	6494	74.1
1998	8327.0	1330	77.6	74.5	76.1	72.9	71.5	67.8	6913	78.9
1999	7636.7	1330	76.1	74.7	73.7	73.0	65.5	67.7	6505	74.3
2000	9819.8	1330	94.7	76.0	94.4	74.4	84.1	68.8	8199	93.3
2001	7815.9	1330	81.6	76.4	79.6	74.7	67.1	68.7	6796	77.6
2002	8900.5	1330	82.3	76.7	80.4	75.1	76.4	69.1	7366	84.1
2003	8181.7	1330	74.9	76.6	74.3	75.0	70.2	69.2	6567	75.0
2004	6395.5	1330	57.0	75.6	56.0	74.0	54.7	68.4	5147	58.6
2005	8157.6	1330	76.9	75.6	73.1	74.0	70.0	68.5	6573	75.0
2006	10549.6	1330	98.6	76.7	96.8	75.1	90.5	69.6	8671	99.0
2007	3908.8	1330	36.3	74.9	34.8	73.2	33.5	67.9	3402	38.8
2008	10106.5	1330	98.0	75.9	96.6	74.3	86.5	68.7	8570	97.6

2009	4214.6	1330	42.7	74.5	38.8	72.8	36.2	67.4	3670	41.9
2010	6850.0	1330	61.9	74.0	60.6	72.3	58.8	67.0	5394	61.6
2011	9475.3	1330	84.0	74.4	81.7	72.6	81.3	67.6	7462	85.2
2012	7592.8	1330	66.9	74.1	66.6	72.4	65.0	67.5	5934	67.6
2013	9162.7	1330	82.7	74.4	80.5	72.7	78.6	67.9	7299	83.3
2014	10592.9	1330	94.8	75.1	93.8	73.4	90.9	68.7	8460	96.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		220			892	
B. Refuelling without a maintenance				84		
C. Inspection, maintenance or repair combined with refuelling				851	32	
D. Inspection, maintenance or repair without refuelling				33		
E. Testing of plant systems or components				28	9	
H. Nuclear regulatory requirements					4	
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			19			2
L. Human factor related					7	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			54		0	27
Z. Other					27	
Subtotal	0	220	73	996	971	31
Total		293			1998	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		44
12. Reactor I&C Systems		58
13. Reactor Auxiliary Systems		37
14. Safety Systems	82	34
15. Reactor Cooling Systems		82
16. Steam generation systems		5
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		12
31. Turbine and auxiliaries		42
32. Feedwater and Main Steam System	130	61
33. Circulating Water System		43
35. All other I&C Systems		0
41. Main Generator Systems	7	285
42. Electrical Power Supply Systems		78
XX. Miscellaneous Systems		103
Total	219	885

**FR-39 PALUEL-4****Operator:** EDF (Electricite de France)**Contractor:** FRAM (FRAMATOME)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1330.0 MW(e)

**Design Net Capacity:** 1330.0 MW(e)

**Design Discharge Burnup:** 33000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 8962.8 GW(e)·h

**Energy Availability Factor:** 84.8%

**Load Factor:** 76.9%

**Operating Factor:** 86.1%

**Energy Unavailability Factor:** 15.2%

**Total Off-line Time:** 1221 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	925.2	831.3	878.6	889.7	885.0	889.7	908.6	30.6	339.2	849.8	734.1	801.1	8962.8
<b>EAF (%)</b>	100.0	98.9	95.1	100.0	99.8	99.0	95.3	4.1	35.4	94.0	98.3	99.2	84.8
<b>UCF (%)</b>	100.0	99.0	95.1	100.0	100.0	99.8	96.7	4.1	35.4	96.9	98.8	100.0	85.4
<b>LF (%)</b>	93.5	93.0	88.9	92.9	89.4	92.9	91.8	3.1	35.4	85.8	76.7	81.0	76.9
<b>OF (%)</b>	100.0	100.0	95.8	100.0	96.8	100.0	100.0	3.5	44.9	98.1	100.0	95.0	86.1
<b>EUf (%)</b>	0.0	1.1	4.9	0.0	0.2	1.0	4.7	95.9	64.6	6.0	1.7	0.8	15.2
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.2	0.0	95.9	64.6	1.0	0.0	0.0	13.6
<b>UCLF (%)</b>	0.0	1.1	4.8	0.0	0.0	0.0	3.2	0.0	0.0	2.1	1.2	0.0	1.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.8	1.4	0.1	0.0	2.9	0.5	0.8	0.6

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

LOAD FOLLOWING

**5. Historical Summary**

**Date of Construction Start:** 01 Feb 1980 **Lifetime Generation:** 238078.4 GW(e)·h

**Date of First Criticality:** 29 Mar 1986 **Cumulative Energy Availability Factor:** 77.1%

**Date of Grid Connection:** 11 Apr 1986 **Cumulative Load Factor:** 71.3%

**Date of Commercial Operation:** 01 Jun 1986 **Cumulative Unit Capability Factor:** 78.8%

**Cumulative Energy Unavailability Factor:** 22.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	5171.6	1300	85.7	85.7	85.2	85.2	78.0	78.0	4298	83.7
1987	8014.6	1290	69.8	75.7	69.7	75.5	70.9	73.6	6289	71.8
1988	5909.0	1330	54.0	67.1	53.6	66.8	50.6	64.5	4812	54.8
1989	8268.3	1330	72.1	68.5	71.0	68.0	71.0	66.3	6349	72.5
1990	8067.7	1330	78.7	70.8	78.5	70.3	69.2	67.0	6770	77.3
1991	8325.6	1330	74.5	71.5	74.2	71.0	71.5	67.8	6677	76.2
1992	5553.3	1330	48.9	68.0	48.6	67.6	47.5	64.7	4529	51.6
1993	8683.8	1330	77.8	69.3	75.3	68.6	74.5	66.0	6938	79.2
1994	8329.7	1330	77.3	70.2	76.5	69.5	71.5	66.6	6945	79.3
1995	8346.8	1330	88.5	72.1	88.1	71.5	71.6	67.2	7354	83.9
1996	7848.1	1330	75.2	72.4	72.4	71.6	67.2	67.2	6745	76.8
1997	8633.7	1330	81.9	73.3	78.2	72.1	74.1	67.8	7219	82.4
1998	7776.7	1330	71.2	73.1	68.3	71.8	66.7	67.7	6506	74.3
1999	9879.7	1330	96.1	74.8	94.6	73.5	84.8	68.9	8345	95.3
2000	8358.8	1330	86.0	75.6	84.4	74.3	71.5	69.1	7532	85.7
2001	8581.0	1330	84.5	76.1	82.1	74.8	73.7	69.4	7489	85.5
2002	9303.3	1330	95.7	77.3	92.7	75.9	79.9	70.0	8216	93.8
2003	7960.7	1330	82.8	77.6	81.9	76.2	68.3	69.9	7307	83.4
2004	7138.6	1330	67.9	77.1	64.6	75.6	61.1	69.5	6027	68.6
2005	9682.1	1330	93.3	77.9	89.2	76.3	83.1	70.2	7949	90.7
2006	8270.8	1330	81.4	78.1	77.2	76.3	71.0	70.2	7320	83.6
2007	8421.5	1330	76.8	78.0	73.7	76.2	72.3	70.3	6824	77.9
2008	7962.6	1330	70.8	77.7	69.6	75.9	68.2	70.2	6286	71.6

2009	9337.1	1330	91.4	78.3	88.9	76.5	80.1	70.6	7944	90.7
2010	7709.5	1330	68.9	77.9	67.4	76.1	66.2	70.4	6085	69.5
2011	9571.6	1330	88.7	78.3	87.9	76.5	82.2	70.9	7835	89.4
2012	10040.1	1330	97.7	79.1	97.2	77.3	85.9	71.5	8467	96.4
2013	7036.4	1330	66.3	78.6	64.0	76.8	60.4	71.1	5984	68.3
2014	8962.8	1330	85.4	78.8	84.8	77.1	76.9	71.3	7539	86.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		14			519	0
B. Refuelling without a maintenance	1108			69		
C. Inspection, maintenance or repair combined with refuelling				886	10	
D. Inspection, maintenance or repair without refuelling				30		
E. Testing of plant systems or components				16	0	
H. Nuclear regulatory requirements					3	
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			71			0
L. Human factor related		31			19	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					13	2
Z. Other					70	2
Subtotal	1108	45	71	1001	634	8
Total		1224			1643	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		119
12. Reactor I&C Systems		34
13. Reactor Auxiliary Systems		8
14. Safety Systems		13
15. Reactor Cooling Systems		29
16. Steam generation systems		59
21. Fuel Handling and Storage Facilities		12
31. Turbine and auxiliaries	14	44
32. Feedwater and Main Steam System		14
41. Main Generator Systems		98
42. Electrical Power Supply Systems		29
XX. Miscellaneous Systems		55
Total	14	514

# FR-63 PENLY-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1330.0 MW(e)  
 Design Net Capacity: 1330.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8406.7 GW(e)·h  
 Energy Availability Factor: 77.6%  
 Load Factor: 72.2%  
 Operating Factor: 79.2%  
 Energy Unavailability Factor: 22.4%  
 Total Off-line Time: 1821 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	851.6	813.3	897.5	867.9	889.2	888.1	955.8	885.5	0.0	0.0	451.3	906.3	8406.7
EAF (%)	99.6	99.1	99.6	99.5	98.1	99.5	98.5	90.2	0.0	0.0	48.3	99.2	77.6
UCF (%)	99.6	99.4	99.6	99.5	99.6	99.5	98.5	92.7	0.0	0.0	51.5	99.2	78.3
LF (%)	86.1	91.0	90.8	90.6	89.9	92.7	96.6	89.5	0.0	0.0	47.1	91.6	72.2
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.8	0.0	0.0	56.9	100.0	79.2
EUUF (%)	0.4	0.9	0.4	0.5	1.9	0.5	1.5	9.8	100.0	100.0	51.7	0.8	22.4
PUF (%)	0.0	0.1	0.1	0.1	0.1	0.1	0.1	6.5	100.0	100.0	39.6	0.2	20.6
UCLF (%)	0.3	0.5	0.3	0.4	0.3	0.4	1.4	0.8	0.0	0.0	8.9	0.6	1.1
XUF (%)	0.0	0.3	0.0	0.0	1.5	0.0	0.0	2.5	0.0	0.0	3.2	0.0	0.6

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Sep 1982      Lifetime Generation: 214322.7 GW(e)·h  
 Date of First Criticality: 01 Apr 1990      Cumulative Energy Availability Factor: 81.0%  
 Date of Grid Connection: 04 May 1990      Cumulative Load Factor: 75.7%  
 Date of Commercial Operation: 01 Dec 1990      Cumulative Unit Capability Factor: 82.3%  
    Cumulative Energy Unavailability Factor: 19.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1990	971.2	1330	98.9	98.9	98.9	98.9	98.2	98.2	738	99.2
1991	8436.7	1330	74.3	76.2	74.2	76.2	72.4	74.4	6645	75.9
1992	7922.2	1330	71.2	73.8	70.9	73.6	67.8	71.2	6315	71.9
1993	8023.9	1330	84.6	77.3	71.9	73.1	68.9	70.5	7298	83.3
1994	7969.1	1330	86.1	79.5	85.0	76.0	68.4	70.0	6654	76.0
1995	8879.1	1330	81.9	79.9	80.8	76.9	76.2	71.2	7248	82.7
1996	9530.8	1330	85.7	80.9	85.2	78.3	81.6	72.9	7625	86.8
1997	8503.4	1330	77.5	80.4	76.7	78.1	73.0	72.9	6872	78.4
1998	9965.7	1330	98.0	82.6	97.9	80.5	85.5	74.5	8140	92.9
1999	7998.5	1330	74.4	81.7	71.5	79.5	68.7	73.8	6633	75.7
2000	8271.7	1330	73.8	80.9	73.7	79.0	70.8	73.5	6640	75.6
2001	9825.8	1330	98.7	82.5	98.4	80.7	84.3	74.5	8304	94.8
2002	7146.7	1330	67.2	81.2	66.9	79.6	61.3	73.4	5948	67.9
2003	9290.8	1330	84.6	81.5	84.6	80.0	79.7	73.9	7525	85.9
2004	10500.2	1330	98.9	82.7	98.6	81.3	89.9	75.0	8733	99.4
2005	8491.3	1330	79.1	82.5	76.9	81.0	72.9	74.9	7104	81.1
2006	9533.1	1330	86.1	82.7	83.6	81.1	81.8	75.3	7656	87.4
2007	9243.6	1330	82.7	82.7	82.1	81.2	79.3	75.6	7356	84.0
2008	10743.3	1330	95.5	83.4	95.2	82.0	92.0	76.5	8424	95.9
2009	8878.5	1330	81.8	83.3	80.5	81.9	76.2	76.5	7217	82.4
2010	6627.3	1330	60.4	82.2	59.2	80.8	56.9	75.5	5280	60.3
2011	7976.8	1330	71.4	81.7	71.3	80.3	68.5	75.1	6332	72.3
2012	10477.0	1330	96.0	82.3	95.9	81.0	89.7	75.8	8525	97.1

2013	9002.0	1330	85.7	82.5	84.1	81.2	77.3	75.9	7536	86.0
2014	8406.7	1330	78.3	82.3	77.6	81.0	72.2	75.7	6939	79.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		46			369	0
B. Refuelling without a maintenance				58		
C. Inspection, maintenance or repair combined with refuelling	1749			772	1	
D. Inspection, maintenance or repair without refuelling				155		
E. Testing of plant systems or components				17		
H. Nuclear regulatory requirements					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					3	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			23			3
Z. Other					5	
Subtotal	1749	46	23	1002	379	3
Total		1818			1384	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	46	31
12. Reactor I&C Systems		25
13. Reactor Auxiliary Systems		31
14. Safety Systems		10
15. Reactor Cooling Systems		37
16. Steam generation systems		32
17. Safety I&C Systems (excluding reactor I&C)		3
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries		37
32. Feedwater and Main Steam System		27
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems		102
42. Electrical Power Supply Systems		7
XX. Miscellaneous Systems		15
Total	46	361



## FR-64 PENLY-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1330.0 MW(e)

Design Net Capacity: 1330.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7123.8 GW(e)·h

Energy Availability Factor: 62.9%

Load Factor: 61.1%

Operating Factor: 65.3%

Energy Unavailability Factor: 37.1%

Total Off-line Time: 3038 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	819.8	0.2	0.0	0.0	3.6	821.3	848.5	910.5	919.9	905.9	920.7	973.5	7123.8
EAF (%)	82.8	0.0	0.0	0.0	0.4	87.2	91.5	95.9	99.6	95.5	97.5	99.0	62.9
UCF (%)	100.0	0.8	0.0	0.0	0.4	87.2	91.5	99.8	99.6	95.5	99.6	99.0	64.9
LF (%)	82.8	0.0	0.0	0.0	0.4	85.8	85.7	92.0	96.1	91.4	96.1	98.4	61.1
OF (%)	100.0	0.7	0.0	0.0	2.3	94.6	90.3	96.2	100.0	94.4	100.0	100.0	65.3
EUf (%)	17.2	100.0	100.0	100.0	99.6	12.8	8.5	4.1	0.4	4.5	2.5	1.0	37.1
PUF (%)	0.0	99.3	100.0	100.0	49.0	7.2	0.1	0.1	0.1	0.1	0.1	0.1	29.1
UCLF (%)	0.0	0.0	0.0	0.0	50.6	5.6	8.3	0.2	0.2	4.5	0.4	1.0	6.0
XUF (%)	17.1	0.7	0.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0	2.1	0.0	2.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Aug 1984      Lifetime Generation: 200753.0 GW(e)·h

Date of First Criticality: 10 Jan 1992      Cumulative Energy Availability Factor: 82.3%

Date of Grid Connection: 04 Feb 1992      Cumulative Load Factor: 76.5%

Date of Commercial Operation: 01 Nov 1992      Cumulative Unit Capability Factor: 83.9%

Cumulative Energy Unavailability Factor: 17.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1992	1970.8	1330	100.0	100.0	100.0	100.0	101.2	101.2	1464	100.0
1993	8611.8	1330	75.2	78.7	74.4	78.1	73.9	77.8	6658	76.0
1994	8759.7	1330	81.3	79.9	77.6	77.8	75.2	76.6	7228	82.5
1995	8169.7	1330	74.0	78.0	73.8	76.6	70.1	74.6	6574	75.0
1996	9758.0	1330	91.3	81.2	89.3	79.6	83.5	76.7	8025	91.4
1997	8068.9	1330	84.3	81.8	82.9	80.3	69.3	75.3	7186	82.0
1998	8877.5	1330	82.9	82.0	81.1	80.4	76.2	75.4	7318	83.5
1999	8637.0	1330	81.3	81.9	79.4	80.2	74.1	75.2	7203	82.2
2000	9584.5	1330	97.1	83.8	96.8	82.3	82.0	76.1	8393	95.5
2001	8816.2	1330	82.1	83.6	80.2	82.1	75.7	76.0	7333	83.7
2002	8464.3	1330	79.1	83.1	79.0	81.8	72.6	75.7	6890	78.7
2003	10207.8	1330	97.6	84.4	97.6	83.2	87.6	76.8	8603	98.2
2004	7225.8	1330	69.2	83.2	69.1	82.0	61.9	75.5	6231	70.9
2005	9102.6	1330	84.8	83.3	84.0	82.2	78.1	75.7	7546	86.1
2006	9885.2	1330	97.7	84.3	97.0	83.2	84.8	76.4	8447	96.4
2007	8718.7	1330	79.4	84.0	76.7	82.8	74.8	76.3	7081	80.8
2008	9474.9	1330	86.1	84.1	85.0	82.9	81.1	76.6	7590	86.4
2009	8954.2	1330	82.0	84.0	80.3	82.8	76.9	76.6	7258	82.9
2010	9987.0	1330	97.7	84.8	96.5	83.5	85.7	77.1	8571	97.8
2011	9873.1	1330	89.5	85.0	87.2	83.7	84.7	77.5	7931	90.5
2012	7151.3	1330	65.6	84.0	65.3	82.8	61.2	76.7	5802	66.1
2013	10253.3	1330	99.1	84.8	92.6	83.3	88.0	77.2	8413	96.0
2014	7123.8	1330	64.9	83.9	62.9	82.3	61.1	76.5	5722	65.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1992 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		507			432	
B. Refuelling without a maintenance				62		
C. Inspection, maintenance or repair combined with refuelling	2471			709		
E. Testing of plant systems or components				36		
H. Nuclear regulatory requirements					14	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			27			
L. Human factor related		3			2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			29			3
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			6		2	4
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						13
Z. Other					2	
Subtotal	2471	510	62	807	452	20
Total		3043			1279	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1992 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		31
12. Reactor I&C Systems		20
13. Reactor Auxiliary Systems	168	12
14. Safety Systems	15	16
15. Reactor Cooling Systems		96
16. Steam generation systems	34	12
21. Fuel Handling and Storage Facilities	36	9
31. Turbine and auxiliaries	14	36
32. Feedwater and Main Steam System	38	19
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems	86	3
42. Electrical Power Supply Systems		137
XX. Miscellaneous Systems	115	34
Total	506	425

# FR-48 ST. ALBAN-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1335.0 MW(e)

Design Net Capacity: 1335.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6739.3 GW(e)·h

Energy Availability Factor: 72.4%

Load Factor: 57.6%

Operating Factor: 67.6%

Energy Unavailability Factor: 27.6%

Total Off-line Time: 2842 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	910.2	810.6	547.1	0.0	0.0	402.5	407.8	338.8	818.6	832.6	759.4	911.7	6739.3
EAF (%)	96.7	100.0	56.1	0.0	0.0	43.7	84.3	99.6	93.8	97.7	98.8	99.4	72.4
UCF (%)	96.7	100.0	67.7	0.0	0.0	44.8	84.9	99.7	95.3	99.3	99.5	99.5	73.9
LF (%)	91.6	90.4	55.2	0.0	0.0	41.9	41.1	34.1	85.2	83.7	79.0	91.8	57.6
OF (%)	99.5	100.0	67.7	0.0	0.0	50.6	58.2	44.9	94.0	98.1	100.0	100.0	67.6
EUUF (%)	3.3	0.0	43.9	100.0	100.0	56.3	15.7	0.4	6.2	2.3	1.2	0.6	27.6
PUF (%)	0.0	0.0	32.3	100.0	100.0	51.1	0.2	0.0	0.0	0.0	0.1	0.2	23.7
UCLF (%)	3.3	0.0	0.0	0.0	0.0	4.2	15.0	0.3	4.7	0.6	0.4	0.3	2.4
XUF (%)	0.0	0.0	11.6	0.0	0.0	1.1	0.5	0.2	1.5	1.6	0.7	0.0	1.4

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 29 Jan 1979      Lifetime Generation: 228648.7 GW(e)·h

Date of First Criticality: 04 Aug 1985      Cumulative Energy Availability Factor: 74.9%

Date of Grid Connection: 30 Aug 1985      Cumulative Load Factor: 67.1%

Date of Commercial Operation: 01 May 1986      Cumulative Unit Capability Factor: 76.5%

Cumulative Energy Unavailability Factor: 25.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	3909.9	1300	67.6	67.6	66.4	66.4	51.1	51.1	3182	54.1
1987	6101.6	1300	56.6	61.0	56.2	60.3	53.6	52.6	4944	56.4
1988	4562.0	1335	83.4	69.6	82.4	68.7	38.9	47.4	3721	42.4
1989	6781.3	1335	70.7	69.9	63.5	67.3	58.0	50.3	5907	67.4
1990	7799.1	1335	70.4	70.0	68.6	67.6	66.7	53.8	6295	71.9
1991	7935.3	1335	74.4	70.8	73.3	68.6	67.9	56.3	6380	72.8
1992	4812.2	1335	42.1	66.4	42.1	64.6	41.0	54.0	3775	43.0
1993	7376.0	1335	68.2	66.7	65.7	64.7	63.1	55.2	6010	68.6
1994	7575.6	1335	94.5	69.9	93.8	68.1	64.8	56.3	6777	77.4
1995	8535.7	1335	81.1	71.1	78.2	69.2	73.0	58.0	7197	82.2
1996	8126.6	1335	83.7	72.2	83.1	70.5	69.3	59.1	6950	79.1
1997	7112.8	1335	65.5	71.7	63.6	69.9	60.8	59.3	5833	66.6
1998	8255.9	1335	90.6	73.2	89.9	71.5	70.6	60.2	6802	77.6
1999	9240.6	1335	86.3	74.1	85.7	72.5	79.0	61.5	7656	87.4
2000	8027.8	1335	72.2	74.0	71.4	72.4	68.5	62.0	6494	73.9
2001	9298.5	1335	89.8	75.0	89.6	73.5	79.5	63.1	7843	89.5
2002	8768.8	1335	81.0	75.4	79.6	73.9	75.0	63.8	7275	83.0
2003	8691.9	1335	80.6	75.7	78.0	74.1	74.3	64.4	7029	80.2
2004	10127.4	1335	96.6	76.8	95.3	75.3	86.4	65.6	8283	94.3
2005	9697.0	1335	88.6	77.4	86.0	75.8	82.9	66.5	7949	90.7
2006	8882.1	1335	82.5	77.6	78.4	75.9	76.0	67.0	7342	83.8
2007	6342.0	1335	55.9	76.6	54.6	74.9	54.2	66.4	4987	56.9
2008	5610.2	1335	49.3	75.4	49.2	73.8	47.8	65.5	4577	52.1

2009	8681.8	1335	76.7	75.5	74.6	73.8	74.2	65.9	6881	78.6
2010	10759.9	1335	93.1	76.2	92.3	74.6	92.0	67.0	8465	96.6
2011	5946.8	1335	57.1	75.4	54.6	73.8	50.9	66.3	5202	59.4
2012	9171.1	1335	83.1	75.7	82.8	74.1	78.2	66.8	7422	84.5
2013	10069.6	1335	98.7	76.6	97.4	75.0	86.1	67.5	8498	97.0
2014	6739.3	1335	73.9	76.5	72.4	74.9	57.6	67.1	5918	67.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		158			706	
B. Refuelling without a maintenance				73		
C. Inspection, maintenance or repair combined with refuelling	2015			883	7	
D. Inspection, maintenance or repair without refuelling				54	0	
E. Testing of plant systems or components	21			23		
H. Nuclear regulatory requirements					47	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			648			
L. Human factor related					5	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant, spare part delivery problems etc.)			3		9	6
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						2
Z. Other					16	0
Subtotal	2036	158	651	1033	790	11
Total		2845			1834	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		49
12. Reactor I&C Systems		18
13. Reactor Auxiliary Systems		21
14. Safety Systems		11
15. Reactor Cooling Systems		95
16. Steam generation systems		4
21. Fuel Handling and Storage Facilities		12
31. Turbine and auxiliaries	10	128
32. Feedwater and Main Steam System	124	53
33. Circulating Water System		2
35. All other I&C Systems		2
41. Main Generator Systems		191
42. Electrical Power Supply Systems		52
XX. Miscellaneous Systems	24	63
Total	158	701

## FR-49 ST. ALBAN-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1335.0 MW(e)

Design Net Capacity: 1335.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 10438.2 GW(e)·h

Energy Availability Factor: 96.6%

Load Factor: 89.3%

Operating Factor: 99.1%

Energy Unavailability Factor: 3.4%

Total Off-line Time: 76 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	907.8	859.9	901.9	940.0	837.4	786.3	766.8	782.8	854.8	886.6	952.4	961.5	10438.2
EAF (%)	99.3	99.7	99.5	98.9	99.2	98.7	96.9	90.0	89.2	89.6	99.3	99.0	96.6
UCF (%)	99.3	99.7	99.5	99.2	99.6	99.7	97.6	90.6	90.7	95.7	99.3	99.0	97.5
LF (%)	91.4	95.9	90.9	97.8	84.3	81.8	77.2	78.8	88.9	89.1	99.1	96.8	89.3
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	98.5	100.0	100.0	91.3	100.0	100.0	99.1
EUf (%)	0.7	0.3	0.5	1.1	0.8	1.3	3.1	10.0	10.8	10.4	0.7	1.0	3.4
PUF (%)	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	1.4	0.2	0.2	0.2
UCLF (%)	0.7	0.3	0.5	0.8	0.4	0.3	2.4	9.3	9.3	2.9	0.6	0.8	2.4
XUF (%)	0.0	0.0	0.0	0.2	0.4	1.0	0.7	0.6	1.5	6.1	0.0	0.0	0.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

BASE LOAD

### 5. Historical Summary

Date of Construction Start: 31 Jul 1979      Lifetime Generation: 223303.2 GW(e)·h

Date of First Criticality: 07 Jun 1986      Cumulative Energy Availability Factor: 75.3%

Date of Grid Connection: 03 Jul 1986      Cumulative Load Factor: 68.0%

Date of Commercial Operation: 01 Mar 1987      Cumulative Unit Capability Factor: 77.7%

Cumulative Energy Unavailability Factor: 24.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	5639.8	1300	79.1	79.1	79.0	79.0	59.1	59.1	5014	68.3
1988	5185.0	1335	47.3	61.5	46.5	61.1	44.2	50.9	4308	49.0
1989	6126.5	1335	57.5	60.1	56.2	59.4	52.4	51.4	4806	54.9
1990	6070.6	1335	60.3	60.1	56.5	58.6	51.9	51.5	5146	58.7
1991	7962.6	1335	73.3	62.9	71.1	61.2	68.1	55.0	6484	74.0
1992	6375.1	1335	64.3	63.1	62.3	61.4	54.4	54.9	5405	61.5
1993	6433.1	1335	90.9	67.2	83.1	64.6	55.0	54.9	6121	69.9
1994	7125.8	1335	74.9	68.2	73.0	65.7	60.9	55.7	6074	69.3
1995	7751.4	1335	76.1	69.1	72.7	66.5	66.3	56.9	6763	77.2
1996	8344.6	1335	81.5	70.3	79.7	67.8	71.2	58.3	7247	82.5
1997	8049.7	1335	92.3	72.4	91.8	70.0	68.8	59.3	7072	80.7
1998	6555.7	1335	66.7	71.9	63.2	69.4	56.1	59.0	5654	64.5
1999	8607.0	1335	80.3	72.6	79.3	70.2	73.6	60.2	7188	82.1
2000	8729.6	1335	86.5	73.6	79.0	70.9	74.4	61.2	7202	82.0
2001	8654.8	1335	91.4	74.8	91.3	72.2	74.0	62.1	7657	87.4
2002	8290.6	1335	77.3	74.9	75.2	72.4	70.9	62.6	6950	79.3
2003	9254.8	1335	87.8	75.7	83.0	73.1	79.1	63.6	7558	86.3
2004	10476.5	1335	97.8	76.9	97.7	74.4	89.3	65.0	8709	99.1
2005	7238.0	1335	70.6	76.6	65.2	73.9	61.9	64.9	6361	72.6
2006	7584.2	1335	69.1	76.2	67.4	73.6	64.9	64.9	6292	71.8
2007	10476.0	1335	95.6	77.2	95.0	74.6	89.6	66.1	8660	98.9
2008	6270.9	1335	58.1	76.3	54.7	73.7	53.5	65.5	5320	60.6
2009	8753.2	1335	81.8	76.5	78.4	73.9	74.8	65.9	7052	80.5

2010	8297.5	1335	76.2	76.5	73.0	73.9	71.0	66.1	6659	76.0
2011	10599.7	1335	95.3	77.3	94.1	74.7	90.6	67.1	8474	96.7
2012	8662.3	1335	78.4	77.3	77.4	74.8	73.9	67.4	7044	80.2
2013	7287.9	1335	66.8	76.9	66.5	74.5	62.3	67.2	6032	68.9
2014	10438.2	1335	97.5	77.7	96.6	75.3	89.3	68.0	8684	99.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		27			700	
B. Refuelling without a maintenance				48		
C. Inspection, maintenance or repair combined with refuelling				886	22	
D. Inspection, maintenance or repair without refuelling				67		
E. Testing of plant systems or components	10			48	1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						5
L. Human factor related					21	0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						24
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			39		0	15
Z. Other					11	0
Subtotal	10	27	39	1049	755	44
Total		76			1848	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		48
12. Reactor I&C Systems		52
13. Reactor Auxiliary Systems		12
14. Safety Systems		18
15. Reactor Cooling Systems		42
16. Steam generation systems		93
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		23
31. Turbine and auxiliaries	11	114
32. Feedwater and Main Steam System		58
33. Circulating Water System		0
35. All other I&C Systems		2
41. Main Generator Systems		135
42. Electrical Power Supply Systems	16	35
XX. Miscellaneous Systems		57
Total	27	691

# FR-17 ST. LAURENT B-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 915.0 MW(e)  
 Design Net Capacity: 915.0 MW(e)  
 Design Discharge Burnup: 33735 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6259.2 GW(e)·h  
 Energy Availability Factor: 79.1%  
 Load Factor: 78.1%  
 Operating Factor: 84.7%  
 Energy Unavailability Factor: 20.9%  
 Total Off-line Time: 1343 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	663.3	593.1	659.2	455.1	432.2	0.0	573.4	370.2	616.6	655.2	575.8	665.1	6259.2
EAF (%)	97.8	97.5	97.1	69.1	64.5	0.0	86.6	60.2	94.6	96.1	87.4	97.7	79.1
UCF (%)	99.7	99.9	99.7	69.9	65.8	10.6	89.2	63.5	98.3	99.8	89.9	99.8	82.2
LF (%)	97.4	96.5	97.0	69.1	63.5	0.0	84.2	54.4	93.6	96.1	87.4	97.7	78.1
OF (%)	100.0	100.0	100.0	100.0	69.4	0.0	94.9	60.3	100.0	100.0	91.4	100.0	84.7
EUUF (%)	2.2	2.5	2.9	30.9	35.5	100.0	13.4	39.8	5.4	3.9	12.6	2.3	20.9
PUF (%)	0.3	0.1	0.3	0.0	25.5	78.8	5.7	0.3	0.3	0.1	0.4	0.2	9.3
UCLF (%)	0.0	0.0	0.0	30.1	8.7	10.6	5.1	36.2	1.4	0.1	9.7	0.0	8.5
XUF (%)	1.9	2.3	2.6	0.8	1.3	10.6	2.6	3.3	3.6	3.7	2.5	2.1	3.1

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 May 1976      Lifetime Generation: 185321.7 GW(e)·h  
 Date of First Criticality: 04 Jan 1981      Cumulative Energy Availability Factor: 76.5%  
 Date of Grid Connection: 21 Jan 1981      Cumulative Load Factor: 73.2%  
 Date of Commercial Operation: 01 Aug 1983      Cumulative Unit Capability Factor: 78.6%  
    Cumulative Energy Unavailability Factor: 23.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	2970.0	880	92.0	92.0	92.0	92.0	91.9	91.9	3447	93.8
1984	4401.0	880	56.0	66.6	56.0	66.6	56.9	67.2	5042	57.4
1985	5630.4	880	76.1	70.5	75.0	70.1	73.0	69.6	6827	77.9
1986	5476.4	880	79.8	73.2	79.7	72.9	71.0	70.0	7144	81.6
1987	5171.3	880	76.8	74.0	76.1	73.6	67.1	69.4	6667	76.1
1988	5721.0	915	76.3	74.5	75.9	74.1	71.2	69.7	6464	73.6
1989	6609.8	915	85.4	76.2	82.7	75.4	82.5	71.8	7699	87.9
1990	6113.7	915	86.3	77.6	84.1	76.6	76.3	72.4	7089	80.9
1991	4005.4	915	53.7	74.7	52.3	73.7	50.0	69.7	4736	54.1
1992	5621.1	915	75.4	74.8	74.0	73.7	69.9	69.7	6690	76.2
1993	5668.5	915	75.3	74.8	72.4	73.6	70.7	69.8	6821	77.9
1994	6095.7	915	87.0	75.9	85.1	74.6	76.1	70.4	7252	82.8
1995	4443.0	915	64.3	75.0	60.3	73.4	55.4	69.1	5211	59.5
1996	5541.1	915	79.1	75.3	78.8	73.9	68.9	69.1	6888	78.4
1997	5132.6	915	76.2	75.3	75.4	74.0	64.0	68.8	6404	73.1
1998	6030.7	915	84.6	75.9	82.1	74.5	75.2	69.2	7366	84.1
1999	5062.6	915	69.7	75.6	67.9	74.1	63.2	68.8	6207	70.9
2000	5086.7	915	66.4	75.0	66.0	73.6	63.3	68.5	5957	67.8
2001	6814.8	915	86.8	75.7	86.4	74.3	85.0	69.4	7735	88.3
2002	6637.0	915	85.6	76.2	83.4	74.8	82.8	70.1	7592	86.7
2003	6630.4	915	86.5	76.7	82.8	75.2	82.7	70.7	7658	87.4
2004	6364.2	915	82.4	77.0	80.4	75.4	79.2	71.1	7356	83.7
2005	5384.1	915	69.5	76.6	68.1	75.1	67.2	70.9	6186	70.6

2006	6914.1	915	88.9	77.2	88.2	75.7	86.3	71.6	7973	91.0
2007	6426.7	915	83.1	77.4	80.5	75.9	80.2	72.0	7380	84.2
2008	6894.1	915	90.8	77.9	88.6	76.4	85.8	72.5	8034	91.5
2009	6241.5	915	83.2	78.1	78.4	76.5	77.9	72.7	7298	83.3
2010	6802.1	915	89.8	78.6	84.9	76.8	84.9	73.2	7967	90.9
2011	5948.0	915	78.7	78.6	74.2	76.7	74.2	73.2	7000	79.9
2012	6577.6	915	89.3	78.9	83.9	76.9	81.8	73.5	7708	87.8
2013	4822.5	915	64.4	78.5	60.3	76.4	60.2	73.0	5662	64.6
2014	6259.2	915	82.2	78.6	79.1	76.5	78.1	73.2	7417	84.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		475			499	
B. Refuelling without a maintenance	756			82		
C. Inspection, maintenance or repair combined with refuelling				1069	16	
E. Testing of plant systems or components				8	2	
H. Nuclear regulatory requirements					0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			35			6
L. Human factor related					4	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			76		27	15
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					270	1
Z. Other					7	1
Subtotal	756	475	111	1159	825	23
Total		1342			2007	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems	35	32
13. Reactor Auxiliary Systems		16
14. Safety Systems		34
15. Reactor Cooling Systems		9
16. Steam generation systems		66
21. Fuel Handling and Storage Facilities		10
31. Turbine and auxiliaries	62	45
32. Feedwater and Main Steam System		18
33. Circulating Water System		2
41. Main Generator Systems		137
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems	377	102
Total	474	492



## FR-23 ST. LAURENT B-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 915.0 MW(e)

Design Net Capacity: 880.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5991.7 GW(e)·h

Energy Availability Factor: 75.3%

Load Factor: 74.8%

Operating Factor: 80.3%

Energy Unavailability Factor: 24.7%

Total Off-line Time: 1725 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	664.3	538.2	660.4	630.3	457.3	590.2	582.2	433.4	0.0	138.9	631.5	665.1	5991.7
EAF (%)	97.6	89.9	97.1	95.7	70.0	89.6	86.5	63.7	0.0	20.3	95.8	97.8	75.3
UCF (%)	99.8	91.7	99.9	99.4	73.5	95.5	90.2	71.8	0.0	22.4	98.7	99.9	78.5
LF (%)	97.6	87.5	97.1	95.7	67.2	89.6	85.5	63.7	0.0	20.4	95.8	97.7	74.8
OF (%)	100.0	100.0	100.0	100.0	71.2	96.3	100.0	70.7	0.0	26.7	100.0	100.0	80.3
EUUF (%)	2.4	10.1	2.9	4.3	30.0	10.4	13.5	36.3	100.0	79.7	4.2	2.2	24.7
PUF (%)	0.2	0.2	0.1	0.3	0.0	0.4	0.2	28.2	79.3	6.0	0.1	0.1	9.6
UCLF (%)	0.0	8.0	0.0	0.3	26.4	4.2	9.6	0.0	20.7	71.6	1.1	0.0	11.9
XUF (%)	2.2	1.9	2.8	3.8	3.5	5.9	3.7	8.1	0.0	2.1	2.9	2.1	3.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Jul 1976      Lifetime Generation: 182213.7 GW(e)·h

Date of First Criticality: 12 May 1981      Cumulative Energy Availability Factor: 75.7%

Date of Grid Connection: 01 Jun 1981      Cumulative Load Factor: 70.7%

Date of Commercial Operation: 01 Aug 1983      Cumulative Unit Capability Factor: 77.7%

Cumulative Energy Unavailability Factor: 24.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	512.0	880	16.1	16.1	16.1	16.1	15.8	15.8	615	16.7
1984	5724.0	880	88.9	67.4	88.9	67.4	74.0	56.9	7237	82.4
1985	5295.6	880	77.6	71.6	75.7	70.8	68.7	61.8	6806	77.7
1986	5662.8	880	81.7	74.6	79.8	73.4	73.5	65.2	7337	83.8
1987	5060.2	880	79.9	75.8	79.4	74.8	65.6	65.3	6798	77.6
1988	5108.0	880	69.6	74.6	69.6	73.8	66.1	65.4	6262	71.3
1989	5034.0	880	81.4	75.7	75.9	74.2	65.3	65.4	6490	74.1
1990	5165.9	915	73.8	75.4	71.3	73.8	64.4	65.3	6212	70.9
1991	6043.0	915	86.1	76.7	84.2	75.0	75.4	66.5	7374	84.2
1992	5490.1	915	80.6	77.1	79.4	75.5	68.3	66.7	6982	79.5
1993	5042.2	915	68.7	76.3	64.1	74.4	62.9	66.3	6149	70.2
1994	6322.7	915	83.7	77.0	81.2	75.0	78.9	67.5	7406	84.5
1995	5311.3	915	72.9	76.6	72.1	74.8	66.3	67.4	6720	76.7
1996	6057.7	915	82.2	77.1	80.8	75.2	75.4	68.0	7303	83.1
1997	5960.7	915	80.8	77.3	78.1	75.4	74.4	68.4	7147	81.6
1998	6415.3	915	85.7	77.9	83.2	75.9	80.0	69.2	7585	86.6
1999	5845.9	915	79.0	77.9	77.3	76.0	72.9	69.4	7013	80.1
2000	5134.0	915	67.6	77.3	67.0	75.5	63.9	69.1	6069	69.1
2001	6046.7	915	81.7	77.6	80.1	75.7	75.4	69.4	7226	82.5
2002	6215.0	915	82.7	77.9	82.7	76.1	77.5	69.9	7434	84.9
2003	4702.4	915	61.6	77.0	61.6	75.4	58.7	69.3	5580	63.7
2004	6468.6	915	87.6	77.5	85.6	75.9	80.5	69.8	7838	89.2
2005	5728.0	915	78.6	77.6	77.0	75.9	71.5	69.9	7038	80.3

2006	6004.3	915	89.8	78.1	88.3	76.5	74.9	70.1	7580	86.5
2007	5906.8	915	77.7	78.1	74.7	76.4	73.7	70.3	6949	79.3
2008	6581.4	915	88.0	78.5	86.1	76.8	81.9	70.7	7784	88.6
2009	6175.8	915	80.7	78.6	77.3	76.8	77.0	71.0	7086	80.9
2010	6694.8	915	87.6	78.9	83.6	77.0	83.5	71.4	7737	88.3
2011	5285.0	915	69.4	78.6	66.2	76.7	65.9	71.2	6171	70.4
2012	6502.0	915	85.3	78.8	81.3	76.8	80.9	71.6	7591	86.4
2013	3380.1	915	44.4	77.7	42.4	75.7	42.2	70.6	3990	45.5
2014	5991.7	915	78.5	77.7	75.3	75.7	74.8	70.7	7035	80.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		899			635	
B. Refuelling without a maintenance	780			38		
C. Inspection, maintenance or repair combined with refuelling				1031	12	
D. Inspection, maintenance or repair without refuelling				5		
E. Testing of plant systems or components				13	0	
H. Nuclear regulatory requirements					12	
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			20			0
L. Human factor related					15	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			25			5
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					97	1
Z. Other					35	
Subtotal	780	899	45	1087	806	10
Total		1724			1903	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		16
13. Reactor Auxiliary Systems		18
14. Safety Systems		49
15. Reactor Cooling Systems		41
16. Steam generation systems	0	32
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		22
31. Turbine and auxiliaries	26	235
32. Feedwater and Main Steam System	193	15
35. All other I&C Systems		1
41. Main Generator Systems		63
42. Electrical Power Supply Systems		18
XX. Miscellaneous Systems	679	104
Total	898	628

# FR-18 TRICASTIN-1

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 915.0 MW(e)

Design Net Capacity: 915.0 MW(e)

Design Discharge Burnup: 42000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6743.8 GW(e)·h

Energy Availability Factor: 85.7%

Load Factor: 84.1%

Operating Factor: 87.7%

Energy Unavailability Factor: 14.3%

Total Off-line Time: 1077 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	667.7	590.3	563.9	648.5	621.3	561.9	528.7	10.3	615.5	647.4	628.7	659.6	6743.8
EAF (%)	100.0	100.0	84.3	98.8	91.3	85.7	77.8	1.5	95.1	97.6	99.5	99.9	85.7
UCF (%)	100.0	100.0	84.3	100.0	93.4	88.7	80.6	1.5	97.6	99.6	100.0	99.9	86.9
LF (%)	98.1	96.0	82.9	98.4	91.3	85.3	77.7	1.5	93.4	95.0	95.4	96.9	84.1
OF (%)	100.0	100.0	85.2	100.0	93.8	90.7	80.8	4.4	100.0	100.0	100.0	100.0	87.7
EUf (%)	0.0	0.0	15.7	1.2	8.7	14.3	22.2	98.5	4.9	2.4	0.5	0.1	14.3
PUF (%)	0.0	0.0	0.1	0.0	0.0	0.0	19.4	82.2	2.4	0.0	0.0	0.1	8.8
UCLF (%)	0.0	0.0	15.6	0.0	6.6	11.3	0.1	16.3	0.0	0.4	0.0	0.1	4.2
XUF (%)	0.0	0.0	0.0	1.2	2.1	3.0	2.8	0.0	2.5	2.0	0.5	0.0	1.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Nov 1974      Lifetime Generation: 202061.0 GW(e)·h

Date of First Criticality: 21 Feb 1980      Cumulative Energy Availability Factor: 77.2%

Date of Grid Connection: 31 May 1980      Cumulative Load Factor: 73.2%

Date of Commercial Operation: 01 Dec 1980      Cumulative Unit Capability Factor: 79.9%

Cumulative Energy Unavailability Factor: 22.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	656.0	918	56.6	56.6	56.6	56.6	95.8	95.8	722	97.0
1981	4416.0	920	56.3	56.4	56.3	56.4	54.8	58.0	5176	59.1
1982	5909.8	915	82.8	69.0	81.9	68.6	73.7	65.5	8151	93.0
1983	5111.0	915	67.2	68.4	67.2	68.1	63.8	65.0	6097	69.6
1984	6468.0	915	86.7	72.9	86.7	72.7	80.5	68.8	7662	87.2
1985	6217.9	915	86.0	75.5	81.6	74.4	77.6	70.5	7560	86.3
1986	5880.3	915	79.4	76.1	77.0	74.9	73.4	71.0	7188	82.1
1987	5978.1	915	83.5	77.1	78.2	75.3	74.6	71.5	7360	84.0
1988	5836.0	915	79.8	77.5	76.7	75.5	72.6	71.6	7200	82.0
1989	5830.2	915	83.3	78.1	83.2	76.3	72.7	71.7	7550	86.2
1990	5099.7	915	68.8	77.2	65.1	75.2	63.6	70.9	6377	72.8
1991	5909.1	915	83.2	77.7	77.0	75.4	73.7	71.2	7262	82.9
1992	5659.3	915	85.3	78.4	83.0	76.0	70.4	71.1	7573	86.2
1993	6134.8	915	83.9	78.8	77.7	76.1	76.5	71.5	7393	84.4
1994	5008.4	915	75.4	78.5	70.3	75.7	62.5	70.9	6458	73.7
1995	5372.7	915	71.3	78.1	70.6	75.4	67.0	70.6	6374	72.8
1996	7302.1	915	94.5	79.1	93.8	76.5	90.9	71.9	8448	96.2
1997	5548.3	915	73.1	78.7	72.5	76.3	69.2	71.7	6711	76.6
1998	5503.7	915	71.0	78.3	71.0	76.0	68.7	71.6	7075	80.8
1999	3426.7	915	44.9	76.6	44.5	74.4	42.8	70.1	4016	45.8
2000	6644.9	915	87.7	77.1	87.1	75.0	82.7	70.7	7842	89.3
2001	6053.3	915	83.2	77.4	82.0	75.3	75.5	70.9	7261	82.9
2002	6384.6	915	87.7	77.9	86.7	75.8	79.7	71.3	7778	88.8

2003	5670.1	915	85.2	78.2	73.0	75.7	70.7	71.3	7029	80.2
2004	6832.5	915	91.5	78.7	89.0	76.3	85.0	71.9	8049	91.6
2005	5831.0	915	85.3	79.0	74.0	76.2	72.7	71.9	7007	80.0
2006	6466.8	915	90.7	79.4	87.4	76.6	80.7	72.2	7989	91.2
2007	6344.7	915	84.8	79.6	82.6	76.8	79.2	72.5	7496	85.6
2008	6808.2	915	89.7	80.0	87.9	77.2	84.7	72.9	7950	90.5
2009	4655.4	915	63.5	79.4	59.2	76.6	58.1	72.4	5435	62.0
2010	6688.4	915	87.5	79.7	86.7	76.9	83.4	72.8	7755	88.5
2011	5580.1	915	77.4	79.6	76.4	76.9	69.6	72.7	6483	74.0
2012	6339.0	915	82.9	79.7	80.6	77.0	78.9	72.9	7345	83.6
2013	5868.4	915	76.7	79.6	74.7	77.0	73.2	72.9	6741	77.0
2014	6743.8	915	86.9	79.9	85.7	77.2	84.1	73.2	7683	87.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		344			368	1
B. Refuelling without a maintenance	732			50		
C. Inspection, maintenance or repair combined with refuelling				994	8	
D. Inspection, maintenance or repair without refuelling				17	1	
E. Testing of plant systems or components				4	0	
H. Nuclear regulatory requirements					3	
J. Grid limitation, failure or grid unavailability						13
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					10	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					18	9
Z. Other					30	
Subtotal	732	344	0	1065	438	23
Total		1076			1526	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		82
12. Reactor I&C Systems	113	5
13. Reactor Auxiliary Systems		2
14. Safety Systems		7
15. Reactor Cooling Systems		22
16. Steam generation systems		32
21. Fuel Handling and Storage Facilities		8
31. Turbine and auxiliaries	3	44
32. Feedwater and Main Steam System		9
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems		72
42. Electrical Power Supply Systems	106	30
XX. Miscellaneous Systems	121	50
Total	343	363

## FR-19 TRICASTIN-2

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 915.0 MW(e)

Design Net Capacity: 915.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6417.1 GW(e)·h

Energy Availability Factor: 82.1%

Load Factor: 80.1%

Operating Factor: 86.7%

Energy Unavailability Factor: 17.9%

Total Off-line Time: 1167 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	672.5	607.6	669.6	84.3	173.3	639.5	629.0	626.1	612.8	632.4	394.9	675.1	6417.1
EAF (%)	100.0	100.0	99.3	12.8	25.4	97.1	95.9	98.2	98.0	97.0	61.2	99.9	82.1
UCF (%)	100.0	100.0	99.9	13.3	38.7	100.0	99.8	100.0	100.0	100.0	94.7	99.9	87.2
LF (%)	98.8	98.8	98.5	12.8	25.5	97.1	92.4	92.0	93.0	92.8	59.9	99.2	80.1
OF (%)	100.0	100.0	100.0	13.6	30.5	100.0	100.0	100.0	100.0	100.0	96.1	100.0	86.7
EUUF (%)	0.0	0.0	0.7	87.2	74.6	2.9	4.1	1.8	2.0	3.0	38.8	0.1	17.9
PUF (%)	0.0	0.0	0.0	86.6	14.7	0.0	0.1	0.0	0.1	0.0	0.0	0.0	8.4
UCLF (%)	0.0	0.0	0.1	0.2	46.6	0.0	0.2	0.0	0.0	0.0	5.3	0.1	4.4
XUF (%)	0.0	0.0	0.6	0.5	13.3	2.8	3.8	1.8	2.0	3.0	33.5	0.0	5.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Dec 1974      Lifetime Generation: 199396.2 GW(e)·h

Date of First Criticality: 22 Jul 1980      Cumulative Energy Availability Factor: 76.6%

Date of Grid Connection: 07 Aug 1980      Cumulative Load Factor: 72.6%

Date of Commercial Operation: 01 Dec 1980      Cumulative Unit Capability Factor: 79.1%

Cumulative Energy Unavailability Factor: 23.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	466.0	917	68.7	68.7	68.7	68.7	68.1	68.1	568	76.3
1981	6155.1	920	82.3	81.3	82.3	81.3	76.4	75.7	7819	89.3
1982	4056.2	915	63.0	72.5	63.0	72.5	50.6	63.7	5932	67.7
1983	5624.0	915	81.9	75.6	81.9	75.6	70.2	65.8	7245	82.7
1984	6603.0	915	87.2	78.4	87.2	78.4	82.2	69.8	7684	87.5
1985	6261.7	915	86.0	79.9	79.4	78.6	78.1	71.4	7375	84.2
1986	6286.6	915	85.8	80.9	82.6	79.3	78.4	72.6	7631	87.1
1987	5302.3	915	73.2	79.8	69.6	77.9	66.2	71.7	6500	74.2
1988	4896.0	915	76.0	79.3	73.1	77.3	60.9	70.3	6628	75.5
1989	5164.7	915	74.3	78.8	71.4	76.7	64.4	69.7	6650	75.9
1990	5614.4	915	80.9	79.0	72.5	76.2	70.0	69.7	7177	81.9
1991	4459.1	915	60.8	77.3	58.2	74.6	55.6	68.5	5429	62.0
1992	6099.1	915	80.0	77.6	78.7	75.0	75.9	69.1	7118	81.0
1993	5777.1	915	77.3	77.5	72.9	74.8	72.1	69.3	6876	78.5
1994	6216.7	915	81.7	77.8	79.1	75.1	77.6	69.9	7222	82.4
1995	6312.3	915	84.6	78.3	81.6	75.5	78.8	70.5	7504	85.7
1996	6391.3	915	84.9	78.7	82.1	75.9	79.5	71.0	7615	86.7
1997	5218.8	915	68.5	78.1	66.8	75.4	65.1	70.7	6107	69.7
1998	6293.9	915	83.0	78.4	81.2	75.7	78.5	71.1	7354	83.9
1999	5661.5	915	75.0	78.2	73.0	75.6	70.6	71.1	6674	76.2
2000	4293.8	915	56.7	77.1	55.3	74.6	53.4	70.2	5092	58.0
2001	6710.5	915	87.2	77.6	87.1	75.2	83.7	70.9	7779	88.8
2002	6593.9	915	87.1	78.0	86.9	75.7	82.3	71.4	7714	88.1

2003	6196.0	915	88.4	78.5	84.4	76.1	77.3	71.6	7521	85.9
2004	5684.2	915	86.4	78.8	80.7	76.3	70.7	71.6	7271	82.8
2005	5878.7	915	82.6	79.0	77.8	76.3	73.3	71.7	7128	81.4
2006	6221.3	915	83.0	79.1	80.7	76.5	77.6	71.9	7366	84.1
2007	6910.1	915	90.4	79.5	89.3	77.0	86.2	72.4	7989	91.2
2008	4884.4	915	65.1	79.0	63.6	76.5	60.8	72.0	5768	65.7
2009	6083.6	915	79.6	79.0	76.1	76.5	75.9	72.1	7028	80.2
2010	6467.5	915	87.2	79.3	84.8	76.8	80.7	72.4	7629	87.1
2011	4690.9	915	63.0	78.8	60.9	76.2	58.5	72.0	5560	63.5
2012	6847.2	915	87.7	79.1	86.1	76.6	85.2	72.4	7806	88.9
2013	5664.1	915	73.8	78.9	71.9	76.4	70.7	72.3	6607	75.4
2014	6417.1	915	87.2	79.1	82.1	76.6	80.1	72.6	7593	86.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		374			415	
B. Refuelling without a maintenance	696			35		
C. Inspection, maintenance or repair combined with refuelling				999	29	
D. Inspection, maintenance or repair without refuelling				29		
E. Testing of plant systems or components				4	1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					25	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						6
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			96			35
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						2
Z. Other					33	
Subtotal	696	374	96	1067	503	43
Total		1166			1613	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		76
12. Reactor I&C Systems		34
13. Reactor Auxiliary Systems		7
14. Safety Systems		17
15. Reactor Cooling Systems		35
16. Steam generation systems		8
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries	27	71
32. Feedwater and Main Steam System		6
41. Main Generator Systems		35
42. Electrical Power Supply Systems		37
XX. Miscellaneous Systems	346	79
Total	373	409

## FR-25 TRICASTIN-3

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 915.0 MW(e)

Design Net Capacity: 915.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5763.7 GW(e)·h

Energy Availability Factor: 71.8%

Load Factor: 71.9%

Operating Factor: 72.7%

Energy Unavailability Factor: 28.2%

Total Off-line Time: 2391 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	679.3	472.1	351.2	666.8	356.4	0.0	0.0	603.8	641.7	658.7	652.7	681.0	5763.7
EAF (%)	97.8	75.5	51.0	100.0	51.9	0.0	0.0	89.9	99.4	97.4	99.9	100.0	71.8
UCF (%)	97.8	75.5	51.0	100.0	51.9	0.0	3.2	90.3	99.9	99.8	99.9	100.0	72.4
LF (%)	99.8	76.8	51.7	101.2	52.3	0.0	0.0	88.7	97.4	96.6	99.1	100.0	71.9
OF (%)	98.0	76.2	51.3	100.0	52.2	0.0	0.0	95.4	100.0	100.0	100.0	100.0	72.7
EUf (%)	2.2	24.5	49.0	0.0	48.1	100.0	100.0	10.1	0.6	2.6	0.1	0.0	28.2
PUf (%)	0.0	0.0	0.0	0.0	48.1	100.0	39.2	5.1	0.1	0.0	0.1	0.0	16.1
UCLF (%)	2.2	24.5	49.0	0.0	0.0	0.0	57.6	4.6	0.0	0.2	0.0	0.0	11.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.4	0.5	2.3	0.1	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Apr 1975      Lifetime Generation: 203811.4 GW(e)·h

Date of First Criticality: 29 Nov 1980      Cumulative Energy Availability Factor: 78.2%

Date of Grid Connection: 10 Feb 1981      Cumulative Load Factor: 75.2%

Date of Commercial Operation: 11 May 1981      Cumulative Unit Capability Factor: 80.2%

Cumulative Energy Unavailability Factor: 21.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	3998.5	919	78.0	78.0	78.0	78.0	73.9	73.9	4815	81.9
1982	5067.3	915	65.8	70.7	65.8	70.7	63.2	67.5	5966	68.1
1983	6342.0	915	82.8	75.2	82.8	75.2	79.1	71.9	7544	86.1
1984	6682.0	915	85.1	77.9	85.1	77.9	83.1	74.9	7668	87.3
1985	7166.0	915	97.1	82.0	94.3	81.4	89.4	78.0	8518	97.2
1986	6230.4	915	86.8	82.9	83.5	81.8	77.7	78.0	7704	87.9
1987	5654.3	915	76.9	82.0	75.4	80.8	70.5	76.9	6810	77.7
1988	5722.0	915	80.3	81.7	78.0	80.5	71.2	76.1	7106	80.9
1989	5834.6	915	80.9	81.7	75.9	79.9	72.8	75.7	7188	82.1
1990	6457.2	915	85.8	82.1	84.6	80.4	80.6	76.2	7671	87.6
1991	4746.8	915	66.5	80.6	62.1	78.7	59.2	74.6	5941	67.8
1992	5199.0	915	67.5	79.5	66.6	77.7	64.7	73.8	6010	68.4
1993	6423.9	915	83.3	79.8	81.4	78.0	80.1	74.3	7373	84.2
1994	6496.5	915	86.3	80.3	83.6	78.4	81.1	74.8	7641	87.2
1995	6494.7	915	87.0	80.7	85.1	78.8	81.0	75.2	7675	87.6
1996	5806.7	915	79.3	80.6	76.2	78.7	72.2	75.0	7172	81.6
1997	6192.8	915	82.6	80.7	79.1	78.7	77.3	75.2	7331	83.7
1998	6359.5	915	82.3	80.8	80.5	78.8	79.3	75.4	7375	84.2
1999	5731.7	915	76.7	80.6	74.0	78.5	71.5	75.2	6828	77.9
2000	5985.2	915	82.3	80.7	79.0	78.6	74.5	75.1	7325	83.4
2001	4929.5	915	65.8	80.0	65.2	77.9	61.5	74.5	5777	65.9
2002	5976.1	915	80.4	80.0	80.2	78.0	74.6	74.5	7140	81.5
2003	6144.9	915	86.9	80.3	79.7	78.1	76.7	74.6	7607	86.8

2004	6377.1	915	84.3	80.5	82.9	78.3	79.3	74.8	7455	84.9
2005	6563.0	915	90.4	80.9	86.1	78.6	81.9	75.1	7981	91.1
2006	6006.9	915	86.5	81.1	81.3	78.7	74.9	75.1	7488	85.5
2007	6775.0	915	89.0	81.4	87.6	79.0	84.5	75.4	7862	89.7
2008	6185.2	915	79.7	81.3	78.6	79.0	77.0	75.5	7030	80.0
2009	5750.6	915	75.9	81.1	73.6	78.8	71.7	75.3	6608	75.4
2010	6257.5	915	80.1	81.1	79.1	78.8	78.1	75.4	7089	80.9
2011	5827.6	915	73.4	80.9	72.8	78.6	72.7	75.4	6507	74.3
2012	4959.8	915	61.9	80.3	61.5	78.1	61.7	74.9	5534	63.0
2013	6912.6	915	87.9	80.5	87.6	78.4	86.2	75.3	7765	88.6
2014	5763.7	915	72.4	80.2	71.8	78.2	71.9	75.2	6369	72.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		999			378	
B. Refuelling without a maintenance				56		
C. Inspection, maintenance or repair combined with refuelling	1368			977	8	
D. Inspection, maintenance or repair without refuelling				27		
E. Testing of plant systems or components				4	1	
H. Nuclear regulatory requirements					1	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					28	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			24		18	2
Z. Other					28	
Subtotal	1368	999	24	1064	462	6
Total		2391			1532	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		15
12. Reactor I&C Systems		35
13. Reactor Auxiliary Systems		21
14. Safety Systems		26
15. Reactor Cooling Systems	369	34
16. Steam generation systems		3
17. Safety I&C Systems (excluding reactor I&C)		3
21. Fuel Handling and Storage Facilities		5
31. Turbine and auxiliaries		69
32. Feedwater and Main Steam System		7
35. All other I&C Systems		2
41. Main Generator Systems	15	103
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems	614	38
Total	998	370



## FR-26 TRICASTIN-4

Operator: EDF (Electricite de France)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 915.0 MW(e)

Design Net Capacity: 915.0 MW(e)

Design Discharge Burnup: 33735 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5218.8 GW(e)·h

Energy Availability Factor: 65.5%

Load Factor: 65.1%

Operating Factor: 66.5%

Energy Unavailability Factor: 34.5%

Total Off-line Time: 2932 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	689.9	617.2	674.5	647.8	658.7	639.0	649.3	623.9	0.0	0.0	0.0	18.5	5218.8
EAF (%)	99.9	100.0	100.0	99.3	99.2	97.5	96.7	91.9	0.0	0.0	0.0	2.7	65.5
UCF (%)	99.9	100.0	100.0	99.6	100.0	100.0	99.9	93.5	0.0	0.0	0.0	7.8	66.6
LF (%)	101.3	100.4	99.2	98.3	96.8	97.0	95.4	91.7	0.0	0.0	0.0	2.7	65.1
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.7	0.0	0.0	0.0	5.9	66.5
EUf (%)	0.1	0.0	0.0	0.7	0.8	2.5	3.3	8.1	100.0	100.0	100.0	97.3	34.5
PUf (%)	0.1	0.0	0.0	0.4	0.0	0.0	0.1	6.5	100.0	100.0	100.0	45.4	29.4
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.8	4.0
XUF (%)	0.0	0.0	0.0	0.3	0.8	2.5	3.2	1.6	0.0	0.0	0.0	5.1	1.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 May 1975      Lifetime Generation: 198705.7 GW(e)·h

Date of First Criticality: 31 May 1981      Cumulative Energy Availability Factor: 79.3%

Date of Grid Connection: 12 Jun 1981      Cumulative Load Factor: 74.3%

Date of Commercial Operation: 01 Nov 1981      Cumulative Unit Capability Factor: 81.9%

Cumulative Energy Unavailability Factor: 20.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	1283.6	917	97.2	97.2	97.2	97.2	95.3	95.3	1462	99.9
1982	5470.5	915	69.8	73.8	69.8	73.8	68.2	72.1	6311	72.0
1983	6170.0	915	80.7	77.0	80.7	77.0	77.0	74.4	7386	84.3
1984	5446.0	915	87.1	80.2	87.1	80.2	67.8	72.3	7587	86.4
1985	6161.7	915	91.3	82.8	84.8	81.3	76.9	73.4	7816	89.2
1986	5873.9	915	85.7	83.4	81.8	81.4	73.3	73.4	7568	86.4
1987	5725.7	915	84.2	83.5	80.1	81.2	71.4	73.0	7257	82.8
1988	3770.0	915	67.7	81.3	66.2	79.1	46.9	69.4	4772	54.3
1989	5729.1	915	82.9	81.5	79.8	79.2	71.5	69.7	7335	83.7
1990	5201.6	915	82.7	81.6	77.4	79.0	64.9	69.1	7329	83.7
1991	5742.8	915	77.1	81.2	74.5	78.5	71.6	69.4	6838	78.1
1992	6459.3	915	90.2	82.0	86.7	79.3	80.4	70.4	7968	90.7
1993	5302.8	915	80.1	81.8	70.9	78.6	66.2	70.0	6842	78.1
1994	5953.0	915	80.9	81.8	77.8	78.5	74.3	70.3	7049	80.5
1995	6208.9	915	85.7	82.0	82.0	78.8	77.5	70.8	7562	86.3
1996	6700.4	915	87.6	82.4	86.5	79.3	83.4	71.7	7774	88.5
1997	6488.8	915	86.0	82.6	84.8	79.6	81.0	72.2	7595	86.7
1998	5913.0	915	80.4	82.5	76.2	79.4	73.8	72.3	7138	81.5
1999	5887.9	915	80.5	82.4	78.0	79.3	73.5	72.4	7158	81.7
2000	5780.3	915	77.4	82.1	75.8	79.2	71.9	72.4	6873	78.2
2001	6036.9	915	83.0	82.2	81.2	79.3	75.3	72.5	7138	81.5
2002	6260.6	915	84.0	82.3	81.9	79.4	78.1	72.8	7168	81.8
2003	6387.9	915	82.9	82.3	79.9	79.4	79.7	73.1	7399	84.5

2004	4724.1	915	59.8	81.3	58.8	78.5	58.8	72.5	5359	61.0
2005	6501.4	915	88.8	81.6	83.6	78.7	81.1	72.8	7728	88.2
2006	6410.4	915	84.1	81.7	83.0	78.9	80.0	73.1	7412	84.6
2007	7047.0	915	92.2	82.1	90.4	79.3	87.9	73.7	8096	92.4
2008	6016.6	915	77.4	81.9	76.4	79.2	74.9	73.7	6867	78.2
2009	6536.7	915	86.5	82.1	84.8	79.4	81.6	74.0	7630	87.1
2010	6263.8	915	82.3	82.1	80.0	79.4	78.1	74.1	7275	83.0
2011	6477.8	915	86.2	82.2	84.3	79.6	80.8	74.4	7589	86.6
2012	5937.3	915	82.1	82.2	78.0	79.6	73.9	74.3	7062	80.4
2013	6556.1	915	87.2	82.4	84.2	79.7	81.8	74.6	7607	86.8
2014	5218.8	915	66.6	81.9	65.5	79.3	65.1	74.3	5828	66.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		348			249	0
B. Refuelling without a maintenance				31		
C. Inspection, maintenance or repair combined with refuelling	2544			979	9	
D. Inspection, maintenance or repair without refuelling				17		
E. Testing of plant systems or components	0			2		
H. Nuclear regulatory requirements					0	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						21
L. Human factor related					23	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)			38		25	18
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						2
Z. Other					38	0
Subtotal	2544	348	38	1029	344	44
Total		2930			1417	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		24
12. Reactor I&C Systems		15
13. Reactor Auxiliary Systems		10
14. Safety Systems		34
15. Reactor Cooling Systems		18
16. Steam generation systems		25
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		9
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems		33
42. Electrical Power Supply Systems		15
XX. Miscellaneous Systems	348	37
Total	348	243

# DE-32 BROKDORF

Operator: E.ON (E.ON Kernkraft GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1410.0 MW(e)  
 Design Net Capacity: 1307.0 MW(e)  
 Design Discharge Burnup: 34000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 10974.2 GW(e)·h  
 Energy Availability Factor: 92.8%  
 Load Factor: 88.9%  
 Operating Factor: 92.9%  
 Energy Unavailability Factor: 7.2%  
 Total Off-line Time: 623 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	1011.5	915.5	1006.3	990.1	995.1	659.9	472.8	948.3	977.4	1022.3	982.4	992.7	10974.2
EAF (%)	100.0	100.0	100.0	100.0	100.0	67.0	46.9	100.0	100.0	100.0	100.0	100.0	92.8
UCF (%)	100.0	100.0	100.0	100.0	100.0	67.0	46.9	100.0	100.0	100.0	100.0	100.0	92.8
LF (%)	96.4	96.6	96.1	97.5	94.9	65.0	45.1	90.4	96.3	97.4	96.8	94.6	88.9
OF (%)	100.0	100.0	100.0	100.0	100.0	67.5	47.7	100.0	100.0	100.0	100.0	100.0	92.9
EUf (%)	0.0	0.0	0.0	0.0	0.0	33.0	53.1	0.0	0.0	0.0	0.0	0.0	7.2
PUf (%)	0.0	0.0	0.0	0.0	0.0	33.0	51.5	0.0	0.0	0.0	0.0	0.0	7.1
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

ANNUALLY MAINTENANCE AND REFUELING FROM 2014-06-21 TO 2014-07-17

## 5. Historical Summary

Date of Construction Start: 01 Jan 1976      Lifetime Generation: 296357.0 GW(e)·h  
 Date of First Criticality: 08 Oct 1986      Cumulative Energy Availability Factor: 90.1%  
 Date of Grid Connection: 14 Oct 1986      Cumulative Load Factor: 88.1%  
 Date of Commercial Operation: 22 Dec 1986      Cumulative Unit Capability Factor: 90.3%  
    Cumulative Energy Unavailability Factor: 9.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	296.8	1307	100.0	100.0	100.0	100.0	30.5	30.5	228	30.6
1987	9481.3	1307	85.2	86.3	85.2	86.3	82.8	78.7	7477	85.4
1988	8581.8	1326	85.2	85.8	85.2	85.8	73.7	76.3	7014	79.8
1989	8991.3	1326	80.0	83.9	80.0	83.9	77.4	76.6	7134	81.4
1990	8337.2	1326	72.5	81.1	72.5	81.1	71.8	75.4	6447	73.6
1991	9492.7	1326	85.7	82.0	85.7	82.0	81.7	76.7	7542	86.1
1992	10788.0	1326	96.0	84.3	96.0	84.3	92.6	79.3	8461	96.3
1993	9447.1	1326	85.6	84.5	84.8	84.4	81.3	79.6	7441	84.9
1994	10228.6	1326	88.7	85.0	88.7	84.9	88.1	80.6	7793	89.0
1995	9912.4	1326	86.6	85.2	86.6	85.1	85.3	81.2	7833	89.4
1996	10555.4	1326	93.2	86.0	93.2	85.9	90.6	82.1	8212	93.5
1997	11249.3	1326	95.1	86.8	95.1	86.7	96.8	83.4	8328	95.1
1998	10752.3	1326	92.6	87.3	90.4	87.0	92.6	84.2	7966	90.9
1999	11093.3	1370	93.3	87.8	93.3	87.5	92.4	84.8	8177	93.3
2000	11335.1	1370	95.6	88.3	95.6	88.1	94.2	85.5	8397	95.6
2001	11215.4	1370	95.0	88.8	95.0	88.6	93.5	86.1	8331	95.1
2002	11336.9	1370	95.8	89.2	95.8	89.0	94.5	86.6	8405	95.9
2003	10564.6	1370	90.1	89.3	90.1	89.1	88.0	86.7	7903	90.2
2004	11040.8	1370	94.7	89.6	94.7	89.4	91.7	87.0	8327	94.8
2005	11400.7	1370	96.1	89.9	95.9	89.8	95.0	87.4	8433	96.3
2006	11201.3	1370	94.7	90.2	93.7	90.0	93.3	87.7	8307	94.8
2007	11425.6	1370	94.5	90.4	94.3	90.2	95.2	88.1	8293	94.7
2008	11450.4	1410	94.6	90.6	94.1	90.4	92.5	88.3	8320	94.7

2009	11459.4	1410	94.1	90.7	94.1	90.5	92.8	88.5	8260	94.3
2010	11360.4	1410	93.4	90.9	93.3	90.7	92.0	88.6	8201	93.6
2011	9701.3	1410	79.2	90.4	79.1	90.2	78.5	88.2	7382	84.3
2012	10246.9	1410	83.6	90.1	83.6	89.9	82.7	88.0	7369	83.9
2013	11146.2	1410	92.1	90.2	92.1	90.0	90.2	88.1	8108	92.6
2014	10974.2	1410	92.8	90.3	92.8	90.1	88.9	88.1	8136	92.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		12			122	
C. Inspection, maintenance or repair combined with refuelling	611			581		
D. Inspection, maintenance or repair without refuelling				6	7	
E. Testing of plant systems or components				0		
H. Nuclear regulatory requirements					43	
L. Human factor related					22	
Z. Other					11	2
Subtotal	611	12	0	587	205	2
Total		623			794	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		37
13. Reactor Auxiliary Systems		6
16. Steam generation systems		1
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		0
41. Main Generator Systems		56
42. Electrical Power Supply Systems	12	18
Total	12	118

## DE-33 EMSLAND

**Operator:** KLE (Kernkraftwerke Lippe-Ems GmbH)  
**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1329.0 MW(e)  
**Design Net Capacity:** 1242.0 MW(e)  
**Design Discharge Burnup:** 32000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 10954.9 GW(e)·h  
**Energy Availability Factor:** 95.1%  
**Load Factor:** 93.9%  
**Operating Factor:** 95.2%  
**Energy Unavailability Factor:** 4.9%  
**Total Off-line Time:** 419 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	989.6	881.9	990.3	925.5	452.1	874.6	975.6	980.6	952.7	989.0	963.3	979.6	10954.9
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	50.7	91.8	100.0	100.0	100.0	100.0	100.0	100.0	95.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	50.7	91.8	100.0	100.0	100.0	100.0	100.0	100.0	95.1
<b>LF (%)</b>	100.1	98.8	100.3	96.7	45.7	91.4	98.2	98.7	99.1	99.4	100.2	98.6	93.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	51.1	92.4	100.0	100.0	100.0	100.0	100.0	100.0	95.2
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	49.3	8.2	0.0	0.0	0.0	0.0	0.0	0.0	4.9
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	49.3	8.2	0.0	0.0	0.0	0.0	0.0	0.0	4.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ANNUAL MAINTENANCE AND REFUELING PROGRAM FROM 2014-05-16 TO 2014-06-01

### 5. Historical Summary

**Date of Construction Start:** 10 Aug 1982  
**Date of First Criticality:** 14 Apr 1988  
**Date of Grid Connection:** 19 Apr 1988  
**Date of Commercial Operation:** 20 Jun 1988

**Lifetime Generation:** 286313.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 93.7%  
**Cumulative Load Factor:** 93.4%  
**Cumulative Unit Capability Factor:** 93.7%  
**Cumulative Energy Unavailability Factor:** 6.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	5694.9	1262	96.8	96.8	96.8	96.8	89.3	89.3	4516	87.9
1989	9857.2	1242	88.7	91.7	88.7	91.7	90.6	90.1	7794	89.0
1990	10039.2	1256	90.4	91.2	90.4	91.2	91.2	90.5	7956	90.8
1991	9287.3	1242	82.0	88.6	82.0	88.6	85.4	89.1	7304	83.4
1992	10158.0	1290	90.2	89.0	90.2	89.0	89.6	89.2	7933	90.3
1993	10477.1	1290	92.9	89.7	92.9	89.7	92.7	89.9	8147	93.0
1994	10526.7	1290	93.4	90.3	93.4	90.3	93.2	90.4	8193	93.5
1995	10495.7	1290	93.1	90.6	93.1	90.6	92.9	90.7	8168	93.2
1996	10557.3	1290	93.2	90.9	93.2	90.9	93.2	91.0	8195	93.3
1997	10650.2	1290	94.6	91.3	94.6	91.3	94.2	91.3	8298	94.7
1998	10794.7	1290	95.7	91.7	95.7	91.7	95.5	91.7	8388	95.8
1999	10729.2	1290	96.0	92.1	96.0	92.1	94.9	92.0	8413	96.0
2000	10802.0	1306	94.9	92.3	94.9	92.3	94.1	92.2	8339	94.9
2001	10933.2	1329	94.1	92.5	93.8	92.4	93.9	92.3	8257	94.3
2002	11242.3	1329	96.9	92.8	96.9	92.8	96.6	92.6	8497	97.0
2003	11097.0	1329	95.8	93.0	95.8	93.0	95.3	92.8	8401	95.9
2004	11147.2	1329	96.1	93.2	96.1	93.2	95.5	93.0	8456	96.3
2005	10887.8	1329	93.9	93.2	93.9	93.2	93.5	93.0	8239	94.0
2006	11147.6	1329	96.4	93.4	95.8	93.3	95.8	93.2	8461	96.6
2007	10989.2	1329	94.7	93.5	94.4	93.4	94.4	93.2	8311	94.9
2008	10896.2	1329	93.4	93.5	93.4	93.4	93.3	93.2	8211	93.5
2009	10849.2	1329	93.3	93.5	93.2	93.4	93.2	93.2	8194	93.5
2010	10978.0	1329	94.4	93.5	94.4	93.4	94.3	93.3	8286	94.6

2011	11055.5	1329	95.1	93.6	95.0	93.5	95.0	93.3	8339	95.2
2012	10847.7	1329	94.5	93.6	94.5	93.5	92.9	93.3	8314	94.6
2013	10912.1	1329	95.0	93.7	95.0	93.6	93.7	93.3	8328	95.1
2014	10954.9	1335	95.1	93.7	95.1	93.7	93.9	93.4	8341	95.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					30	
C. Inspection, maintenance or repair combined with refuelling	419			449		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					2	
Z. Other					2	
Subtotal	419	0	0	449	34	0
Total	419			483		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		13
31. Turbine and auxiliaries		2
41. Main Generator Systems		5
42. Electrical Power Supply Systems		0
Total	0	28

## DE-23 GRAFENRHEINFELD

Operator: E.ON (E.ON Kernkraft GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1275.0 MW(e)

Design Net Capacity: 1225.0 MW(e)

Design Discharge Burnup: 34000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 9853.0 GW(e)·h

Energy Availability Factor: 91.0%

Load Factor: 88.2%

Operating Factor: 92.2%

Energy Unavailability Factor: 9.0%

Total Off-line Time: 679 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	906.7	814.4	885.7	869.7	486.5	597.4	910.6	909.1	731.6	924.9	899.7	916.7	9853.0
EAF (%)	98.8	98.7	98.7	98.8	52.8	67.7	100.0	99.3	81.5	98.6	98.5	98.3	91.0
UCF (%)	98.8	98.7	98.7	98.8	52.8	67.7	100.0	99.3	81.5	98.6	98.5	98.3	91.0
LF (%)	95.6	95.0	93.5	94.7	51.3	65.1	96.0	95.8	79.7	97.4	98.0	96.6	88.2
OF (%)	100.0	100.0	100.0	100.0	53.8	70.0	100.0	100.0	83.5	100.0	100.0	100.0	92.2
EUf (%)	1.2	1.3	1.3	1.2	47.2	32.3	0.0	0.7	18.5	1.4	1.5	1.7	9.0
PUF (%)	0.0	0.2	0.1	0.0	46.6	15.2	0.0	0.0	0.0	0.0	0.0	0.0	5.2
UCLF (%)	1.2	1.2	1.3	1.2	0.6	17.1	0.0	0.7	18.5	1.4	1.5	1.7	3.8
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ANNUALLY MAINTENANCE AND REFUELING FROM 2014-05-17 TO 2014-06-09

### 5. Historical Summary

Date of Construction Start: 01 Jan 1975      Lifetime Generation: 311491.0 GW(e)·h

Date of First Criticality: 09 Dec 1981      Cumulative Energy Availability Factor: 87.6%

Date of Grid Connection: 30 Dec 1981      Cumulative Load Factor: 85.9%

Date of Commercial Operation: 17 Jun 1982      Cumulative Unit Capability Factor: 87.6%

Cumulative Energy Unavailability Factor: 12.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1982	6199.2	1229	98.3	98.3	98.3	98.3	98.2	98.2	5122	99.7
1983	9412.0	1229	87.5	91.5	87.5	91.5	87.4	91.4	7898	90.2
1984	9590.0	1229	88.7	90.4	88.7	90.4	88.8	90.4	7890	89.8
1985	9741.6	1235	90.6	90.4	90.6	90.4	90.0	90.3	8155	93.1
1986	8718.2	1235	80.9	88.3	80.9	88.3	80.6	88.2	7179	82.0
1987	8360.6	1235	77.8	86.5	77.8	86.5	77.3	86.2	7509	85.7
1988	8799.9	1235	84.3	86.1	84.3	86.1	81.1	85.5	7604	86.6
1989	9401.7	1235	88.0	86.4	88.0	86.4	86.9	85.6	7840	89.5
1990	7910.3	1235	73.5	84.9	73.5	84.9	73.1	84.2	6743	77.0
1991	9753.5	1235	92.5	85.7	92.5	85.7	90.2	84.8	8114	92.6
1992	9657.2	1235	91.8	86.3	91.8	86.3	89.0	85.2	8074	91.9
1993	8845.9	1235	84.5	86.1	84.5	86.1	81.8	84.9	7524	85.9
1994	9674.5	1275	88.8	86.3	88.8	86.3	86.6	85.0	8116	92.6
1995	9946.0	1275	93.5	86.9	93.5	86.9	89.1	85.4	8193	93.5
1996	9528.6	1275	89.1	87.0	89.1	87.0	85.1	85.3	7886	89.8
1997	10131.0	1275	93.5	87.5	93.5	87.4	90.7	85.7	8202	93.6
1998	9147.0	1275	84.6	87.3	84.6	87.3	81.9	85.5	7429	84.8
1999	8336.7	1275	76.1	86.6	76.1	86.6	74.6	84.8	6737	76.9
2000	9600.9	1275	89.1	86.8	89.1	86.8	85.7	84.9	7829	89.1
2001	10573.9	1275	95.7	87.2	95.7	87.2	94.7	85.4	8392	95.8
2002	9889.9	1275	91.0	87.4	91.0	87.4	88.5	85.5	7977	91.1
2003	10270.2	1275	93.4	87.7	93.4	87.7	92.0	85.8	8196	93.6
2004	10129.4	1275	91.6	87.9	91.6	87.9	90.4	86.0	8059	91.7

2005	10106.0	1275	91.8	88.0	91.5	88.0	90.5	86.2	8046	91.8
2006	9424.9	1275	85.2	87.9	84.9	87.9	84.4	86.2	7588	86.6
2007	10311.5	1275	93.6	88.1	93.4	88.1	92.3	86.4	8236	94.0
2008	9763.0	1275	88.9	88.2	88.4	88.1	87.2	86.4	7828	89.1
2009	10447.3	1275	94.4	88.4	94.4	88.4	93.5	86.7	8282	94.5
2010	7492.6	1275	67.4	87.7	67.4	87.6	67.1	86.0	5948	67.9
2011	8532.3	1275	77.5	87.3	77.2	87.3	76.4	85.7	6793	77.5
2012	9996.4	1275	91.5	87.4	91.5	87.4	89.3	85.8	8123	92.5
2013	9664.8	1275	89.2	87.5	89.1	87.5	86.5	85.8	7846	89.6
2014	9853.0	1275	91.0	87.6	91.0	87.6	88.2	85.9	8081	92.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		242			187	
C. Inspection, maintenance or repair combined with refuelling	437			762	3	
L. Human factor related					25	
Z. Other					4	
Subtotal	437	242	0	762	219	0
Total		679			981	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		22
14. Safety Systems		0
15. Reactor Cooling Systems		34
16. Steam generation systems		18
31. Turbine and auxiliaries	119	22
32. Feedwater and Main Steam System		13
35. All other I&C Systems		24
41. Main Generator Systems		47
42. Electrical Power Supply Systems	123	3
Total	242	183



## DE-27 GROHNDE

**Operator:** KWG (Gemeinschaftskernkraftwerk Grohnde GmbH & Co. oHG)

**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1360.0 MW(e)  
**Design Net Capacity:** 1289.0 MW(e)  
**Design Discharge Burnup:** 34000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 9481.2 GW(e)·h  
**Energy Availability Factor:** 83.0%  
**Load Factor:** 79.6%  
**Operating Factor:** 83.6%  
**Energy Unavailability Factor:** 17.0%  
**Total Off-line Time:** 1434 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	1020.2	914.0	1001.1	782.3	0.0	266.5	957.1	899.7	906.8	945.2	930.7	857.5	9481.2
<b>EAF (%)</b>	100.0	100.0	100.0	82.4	0.0	31.9	95.2	100.0	99.1	100.0	100.0	88.1	83.0
<b>UCF (%)</b>	100.0	100.0	100.0	82.4	0.0	32.6	100.0	100.0	99.1	100.0	100.0	88.1	83.4
<b>LF (%)</b>	100.8	100.0	99.1	79.9	0.0	27.2	94.6	88.9	92.6	93.3	95.1	84.7	79.6
<b>OF (%)</b>	100.0	100.0	100.0	83.1	0.0	30.7	100.0	100.0	100.0	100.0	100.0	90.7	83.6
<b>EUf (%)</b>	0.0	0.0	0.0	17.6	100.0	68.1	4.8	0.0	0.9	0.0	0.0	11.9	17.0
<b>PUf (%)</b>	0.0	0.0	0.0	17.6	29.8	2.5	0.0	0.0	0.0	0.0	0.0	0.1	4.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	70.2	64.9	0.0	0.0	0.9	0.0	0.0	11.8	12.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.7	4.8	0.0	0.0	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ANNUALLY MAINTENANCE AND REFUELING FROM 2014-04-25 TO 2014-05-05

### 5. Historical Summary

**Date of Construction Start:** 01 Jun 1976 **Lifetime Generation:** 318576.0 GW(e)·h  
**Date of First Criticality:** 01 Sep 1984 **Cumulative Energy Availability Factor:** 91.6%  
**Date of Grid Connection:** 05 Sep 1984 **Cumulative Load Factor:** 90.0%  
**Date of Commercial Operation:** 01 Feb 1985 **Cumulative Unit Capability Factor:** 91.9%  
**Cumulative Energy Unavailability Factor:** 8.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	9896.4	1300	95.2	95.2	95.2	95.2	95.0	95.0	7662	95.6
1986	10205.4	1300	89.7	92.3	89.7	92.3	89.6	92.2	8120	92.7
1987	9648.5	1300	86.4	90.3	86.4	90.3	84.7	89.6	7979	91.1
1988	10208.3	1300	90.8	90.4	90.8	90.4	89.4	89.6	8104	92.3
1989	10279.4	1300	90.3	90.4	90.3	90.4	90.3	89.7	8058	92.0
1990	10123.6	1314	88.1	90.0	88.1	90.0	87.9	89.4	7872	89.9
1991	9957.8	1325	86.4	89.5	86.4	89.5	85.8	88.9	7603	86.8
1992	10424.3	1325	90.0	89.6	90.0	89.6	89.6	89.0	7981	90.9
1993	10680.1	1325	92.8	89.9	92.8	89.9	92.0	89.3	8147	93.0
1994	10266.5	1325	91.9	90.1	91.9	90.1	88.5	89.2	8063	92.0
1995	10771.2	1349	91.1	90.2	91.1	90.2	91.1	89.4	7986	91.2
1996	10589.8	1360	88.9	90.1	88.9	90.1	88.6	89.3	7861	89.5
1997	11864.7	1360	100.0	90.9	100.0	90.9	99.6	90.1	8760	100.0
1998	11146.3	1360	94.5	91.2	94.5	91.2	93.6	90.4	8301	94.8
1999	11212.1	1360	95.3	91.4	95.3	91.4	94.1	90.7	8351	95.3
2000	11055.9	1360	93.7	91.6	93.7	91.6	92.5	90.8	8250	93.9
2001	10926.6	1360	94.7	91.8	94.2	91.7	91.7	90.8	8310	94.9
2002	10791.9	1360	93.8	91.9	93.8	91.9	90.6	90.8	8233	94.0
2003	10933.0	1360	95.0	92.1	95.0	92.0	91.8	90.9	8343	95.2
2004	10695.4	1360	93.6	92.1	93.6	92.1	89.5	90.8	8245	93.9
2005	10840.9	1360	95.1	92.3	94.5	92.2	91.0	90.8	8364	95.5
2006	10995.7	1360	94.5	92.4	94.2	92.3	92.3	90.9	8296	94.7
2007	10818.4	1360	94.1	92.5	93.6	92.4	90.8	90.9	8270	94.4

2008	10545.9	1360	91.3	92.4	91.0	92.3	88.3	90.8	8048	91.6
2009	10867.5	1360	94.4	92.5	92.0	92.3	91.2	90.8	8288	94.6
2010	10782.4	1360	94.1	92.6	92.0	92.3	90.5	90.8	8267	94.4
2011	9603.2	1360	83.4	92.2	81.9	91.9	80.6	90.4	7341	83.8
2012	11008.6	1360	95.1	92.3	94.9	92.0	92.2	90.5	8374	95.3
2013	10420.1	1360	89.4	92.2	89.4	91.9	87.5	90.3	7847	89.6
2014	9481.2	1360	83.4	91.9	83.0	91.6	79.6	90.0	7326	83.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1058			66	
C. Inspection, maintenance or repair combined with refuelling	344			484	3	
D. Inspection, maintenance or repair without refuelling				12		
L. Human factor related					2	
M. Governmental requirements or court decisions			32			
Z. Other					9	
Subtotal	344	1058	32	496	80	0
Total		1434			576	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems		3
15. Reactor Cooling Systems		20
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System	69	1
35. All other I&C Systems		0
41. Main Generator Systems	989	23
42. Electrical Power Supply Systems		3
Total	1058	62

## DE-26 GUNDREMMINGEN-B

Operator: KGG (Kernkraftwerk Gundremmingen GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1284.0 MW(e)

Design Net Capacity: 1244.0 MW(e)

Design Discharge Burnup: 27500 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 9527.1 GW(e)·h

Energy Availability Factor: 84.7%

Load Factor: 84.7%

Operating Factor: 85.4%

Energy Unavailability Factor: 15.3%

Total Off-line Time: 1283 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	516.9	867.8	955.6	143.0	465.8	924.3	946.4	941.1	909.6	961.8	936.2	958.6	9527.1
EAF (%)	53.9	100.0	100.0	15.7	48.7	100.0	100.0	100.0	98.7	100.0	99.8	100.0	84.7
UCF (%)	53.9	100.0	100.0	15.7	48.8	100.0	100.0	100.0	98.7	100.0	99.8	100.0	84.7
LF (%)	54.1	100.6	100.2	15.5	48.8	100.0	99.1	98.5	98.4	100.5	101.3	100.3	84.7
OF (%)	57.0	100.0	100.0	16.1	51.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.4
EUf (%)	46.1	0.0	0.0	84.3	51.3	0.0	0.0	0.0	1.3	0.0	0.2	0.0	15.3
PUf (%)	0.0	0.0	0.0	84.3	35.6	0.0	0.0	0.0	1.3	0.0	0.2	0.0	10.1
UCLF (%)	46.1	0.0	0.0	0.0	15.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ANNUALLY MAINTENANCE AND REFUELING FROM 2014-04-05 TO 2014-05-16

### 5. Historical Summary

Date of Construction Start: 20 Jul 1976      Lifetime Generation: 285468.0 GW(e)·h

Date of First Criticality: 09 Mar 1984      Cumulative Energy Availability Factor: 88.0%

Date of Grid Connection: 16 Mar 1984      Cumulative Load Factor: 83.7%

Date of Commercial Operation: 19 Jul 1984      Cumulative Unit Capability Factor: 88.2%

Cumulative Energy Unavailability Factor: 12.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	4656.0	1250	85.3	85.3	85.3	85.3	84.7	84.7	3958	89.6
1985	9147.5	1244	85.5	85.4	85.5	85.4	83.9	84.2	7852	89.6
1986	8298.3	1244	83.1	84.5	83.1	84.5	76.1	81.0	7434	84.9
1987	8413.2	1240	84.4	84.5	84.4	84.5	77.5	80.0	7876	89.9
1988	7079.3	1240	83.6	84.3	83.6	84.3	65.0	76.7	7706	87.7
1989	9653.7	1240	97.9	86.8	97.9	86.8	88.9	78.9	8743	99.8
1990	8442.3	1240	83.6	86.3	83.6	86.3	77.7	78.7	7717	88.1
1991	8002.7	1240	77.7	85.1	74.8	84.7	73.7	78.0	7520	85.8
1992	7366.8	1240	78.4	84.3	78.4	84.0	67.6	76.8	7073	80.5
1993	8015.8	1240	84.9	84.4	84.9	84.1	73.8	76.5	7632	87.1
1994	8825.6	1240	92.1	85.1	91.7	84.8	81.2	76.9	8213	93.8
1995	8681.7	1284	84.7	85.1	84.7	84.8	77.2	77.0	7535	86.0
1996	9370.9	1284	88.6	85.4	88.6	85.1	83.1	77.5	7903	90.0
1997	9206.1	1284	92.8	85.9	92.8	85.7	81.8	77.8	8264	94.3
1998	9072.1	1284	89.2	86.2	89.2	85.9	80.7	78.0	7996	91.3
1999	9595.4	1284	93.3	86.6	93.3	86.4	85.3	78.5	8257	94.3
2000	9336.4	1284	88.8	86.8	88.8	86.6	82.8	78.7	7887	89.8
2001	10216.7	1284	94.8	87.2	94.8	87.1	90.8	79.5	8405	95.9
2002	9976.9	1284	92.1	87.5	92.1	87.3	88.7	80.0	8139	92.9
2003	10480.4	1284	94.4	87.9	94.4	87.7	93.2	80.7	8325	95.0
2004	10283.1	1284	91.3	88.0	91.3	87.9	91.2	81.2	8208	93.4
2005	10299.9	1284	92.3	88.2	91.5	88.1	91.6	81.7	8145	93.0
2006	10085.8	1284	90.1	88.3	89.4	88.1	89.7	82.0	7963	90.9

2007	10496.5	1284	94.1	88.6	92.9	88.3	93.3	82.5	8299	94.7
2008	9669.9	1284	85.1	88.4	85.1	88.2	85.7	82.6	7568	86.2
2009	10389.9	1284	92.0	88.6	92.0	88.3	92.4	83.0	8111	92.6
2010	9460.8	1284	83.2	88.4	83.2	88.1	84.1	83.1	7362	84.0
2011	10320.1	1284	91.3	88.5	91.3	88.3	91.8	83.4	8054	91.9
2012	9862.7	1284	87.2	88.4	87.2	88.2	87.4	83.5	7731	88.0
2013	9647.4	1284	85.9	88.3	85.9	88.1	85.8	83.6	7644	87.3
2014	9527.1	1284	84.7	88.2	84.7	88.0	84.7	83.7	7477	85.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		437			57	
B. Refuelling without a maintenance				5		
C. Inspection, maintenance or repair combined with refuelling	846			702	1	
D. Inspection, maintenance or repair without refuelling				10		
E. Testing of plant systems or components				0		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				4		
L. Human factor related					1	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					6	
Z. Other					4	
Subtotal	846	437	0	721	69	0
Total		1283			790	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	320	13
12. Reactor I&C Systems		11
13. Reactor Auxiliary Systems		0
14. Safety Systems		0
15. Reactor Cooling Systems		1
16. Steam generation systems		4
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		12
41. Main Generator Systems	117	3
Total	437	52

## DE-28 GUNDREMMINGEN-C

Operator: KGG (Kernkraftwerk Gundremmingen GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1288.0 MW(e)  
 Design Net Capacity: 1249.0 MW(e)  
 Design Discharge Burnup: 27500 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 10031.1 GW(e)·h  
 Energy Availability Factor: 89.4%  
 Load Factor: 88.9%  
 Operating Factor: 90.4%  
 Energy Unavailability Factor: 10.6%  
 Total Off-line Time: 839 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	954.9	871.2	608.1	919.9	938.1	915.4	531.5	546.0	917.3	954.9	919.9	954.0	10031.1
EAF (%)	100.0	100.0	63.9	100.0	99.4	100.0	56.1	57.3	100.0	100.0	98.8	100.0	89.4
UCF (%)	100.0	100.0	63.9	100.0	99.4	100.0	56.1	57.3	100.0	100.0	98.8	100.0	89.4
LF (%)	99.6	100.7	63.5	99.2	97.9	98.7	55.5	57.0	98.9	99.5	99.2	99.6	88.9
OF (%)	100.0	100.0	66.5	100.0	100.0	100.0	60.8	59.9	100.0	100.0	100.0	100.0	90.4
EUf (%)	0.0	0.0	36.1	0.0	0.6	0.0	43.9	42.7	0.0	0.0	1.2	0.0	10.6
PUf (%)	0.0	0.0	0.0	0.0	0.3	0.0	43.8	31.3	0.0	0.0	1.2	0.0	6.5
UCLF (%)	0.0	0.0	36.1	0.0	0.3	0.0	0.1	11.4	0.0	0.0	0.0	0.0	4.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ANNUALLY MAINTENANCE AND REFUELING 2014-07-19 TO 2014-08-13

### 5. Historical Summary

Date of Construction Start: 20 Jul 1976      Lifetime Generation: 277096.0 GW(e)·h  
 Date of First Criticality: 26 Oct 1984      Cumulative Energy Availability Factor: 87.2%  
 Date of Grid Connection: 02 Nov 1984      Cumulative Load Factor: 82.1%  
 Date of Commercial Operation: 18 Jan 1985      Cumulative Unit Capability Factor: 87.4%  
    Cumulative Energy Unavailability Factor: 12.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	9149.6	1244	85.5	85.5	85.5	85.5	84.0	84.0	7663	87.5
1986	8018.5	1244	84.7	85.1	84.7	85.1	73.6	78.8	7945	90.7
1987	7333.2	1248	74.7	81.6	74.7	81.6	67.1	74.9	7345	83.8
1988	7456.1	1248	88.3	83.3	88.3	83.3	68.0	73.1	7887	89.8
1989	7884.5	1248	84.2	83.5	84.2	83.5	72.1	72.9	7722	88.2
1990	8264.8	1248	80.2	82.9	80.2	82.9	75.6	73.4	7519	85.8
1991	8341.3	1248	85.9	83.3	85.9	83.3	76.3	73.8	7709	88.0
1992	9381.0	1248	98.9	85.3	98.9	85.3	85.6	75.3	8784	100.0
1993	6689.2	1248	79.1	84.6	79.1	84.6	61.2	73.7	7051	80.5
1994	7502.0	1248	81.1	84.3	80.7	84.2	68.6	73.2	7147	81.6
1995	9376.7	1288	89.3	84.7	89.3	84.7	83.1	74.1	7929	90.5
1996	9509.0	1288	91.7	85.3	91.7	85.3	84.0	75.0	8176	93.1
1997	9013.6	1288	89.1	85.6	88.7	85.6	79.9	75.4	7861	89.7
1998	9629.5	1288	91.5	86.1	91.5	86.0	85.3	76.1	8153	93.1
1999	8187.6	1288	77.0	85.4	77.0	85.4	72.6	75.9	6942	79.2
2000	10176.8	1288	94.6	86.0	94.6	86.0	90.0	76.8	8375	95.3
2001	9838.4	1288	90.7	86.3	87.2	86.0	87.2	77.4	8016	91.5
2002	10335.8	1288	93.4	86.7	93.4	86.5	91.6	78.2	8301	94.8
2003	9965.6	1288	89.2	86.8	89.2	86.6	88.3	78.7	7931	90.5
2004	8470.5	1288	74.9	86.2	74.9	86.0	74.9	78.5	6747	76.8
2005	10015.6	1288	92.6	86.5	89.2	86.2	88.8	79.0	8158	93.1
2006	10543.0	1288	93.9	86.9	93.7	86.5	93.4	79.7	8289	94.6
2007	9888.3	1288	87.4	86.9	87.4	86.6	87.6	80.0	7729	88.2

2008	9929.0	1288	87.5	86.9	87.3	86.6	87.8	80.4	7737	88.1
2009	10275.2	1288	91.1	87.1	90.9	86.8	91.1	80.8	8036	91.7
2010	10394.8	1288	92.1	87.3	91.7	87.0	92.1	81.2	8125	92.8
2011	9455.0	1288	84.1	87.2	84.1	86.8	83.8	81.3	7412	84.6
2012	10099.1	1288	91.1	87.3	91.1	87.0	89.3	81.6	8057	91.7
2013	10015.7	1288	89.2	87.4	89.2	87.1	88.8	81.9	7850	89.6
2014	10031.1	1288	89.4	87.4	89.4	87.2	88.9	82.1	7921	90.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		334			168	
B. Refuelling without a maintenance				25		
C. Inspection, maintenance or repair combined with refuelling	505			695		
D. Inspection, maintenance or repair without refuelling				17		
E. Testing of plant systems or components				1	1	
L. Human factor related					5	
Subtotal	505	334	0	738	174	0
Total		839			912	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		21
12. Reactor I&C Systems	249	5
14. Safety Systems		11
15. Reactor Cooling Systems		7
16. Steam generation systems		4
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		0
41. Main Generator Systems		90
42. Electrical Power Supply Systems	85	
Total	334	165

**DE-31 ISAR-2****Operator:** E.ON (E.ON Kernkraft GmbH)**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1410.0 MW(e)

**Design Net Capacity:** 1285.0 MW(e)

**Design Discharge Burnup:** 32000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 10794.9 GW(e)·h

**Energy Availability Factor:** 90.5%

**Load Factor:** 87.4%

**Operating Factor:** 95.3%

**Energy Unavailability Factor:** 9.5%

**Total Off-line Time:** 410 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	1029.1	932.6	897.1	779.5	809.9	980.1	440.1	957.8	970.2	1012.3	985.8	1000.4	10794.9
<b>EAF (%)</b>	99.9	100.0	88.4	78.7	78.9	100.0	44.0	97.3	100.0	99.9	100.0	100.0	90.5
<b>UCF (%)</b>	99.9	100.0	88.5	78.7	78.9	100.0	44.8	97.3	100.0	99.9	100.0	100.0	90.5
<b>LF (%)</b>	98.1	98.4	85.6	76.8	77.2	96.5	42.0	91.3	95.6	96.4	97.1	95.4	87.4
<b>OF (%)</b>	100.0	100.0	100.0	98.9	100.0	100.0	46.0	100.0	100.0	100.0	100.0	100.0	95.3
<b>EUf (%)</b>	0.1	0.0	11.6	21.3	21.1	0.0	56.0	2.7	0.0	0.1	0.0	0.0	9.5
<b>PUf (%)</b>	0.1	0.0	0.0	0.0	0.0	0.0	53.0	2.5	0.0	0.1	0.0	0.0	4.7
<b>UCLF (%)</b>	0.0	0.0	11.6	21.3	21.1	0.0	2.2	0.2	0.0	0.0	0.0	0.0	4.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

ANNUALLY MAINTENANCE AND REFUELING FROM 2014-07-12 TO 2014-07-28

**5. Historical Summary**

**Date of Construction Start:** 15 Sep 1982      **Lifetime Generation:** 290168.0 GW(e)·h

**Date of First Criticality:** 15 Jan 1988      **Cumulative Energy Availability Factor:** 92.2%

**Date of Grid Connection:** 22 Jan 1988      **Cumulative Load Factor:** 89.6%

**Date of Commercial Operation:** 09 Apr 1988      **Cumulative Unit Capability Factor:** 92.5%

**Cumulative Energy Unavailability Factor:** 7.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	6023.0	1323	95.1	95.1	95.1	95.1	69.7	69.7	6177	93.6
1989	7728.9	1310	73.4	82.7	73.4	82.7	67.4	68.3	6876	78.5
1990	9271.4	1310	84.9	83.5	84.9	83.5	80.8	72.9	7915	90.4
1991	9699.2	1318	87.8	84.7	87.8	84.7	84.0	75.8	7732	88.3
1992	9843.5	1320	89.9	85.8	89.9	85.8	84.9	77.8	7917	90.1
1993	10193.0	1330	91.3	86.7	88.1	86.2	87.5	79.5	8052	91.9
1994	10499.9	1330	93.1	87.7	93.1	87.2	90.1	81.1	8209	93.7
1995	10040.3	1332	89.8	88.0	89.8	87.6	86.0	81.7	7891	90.1
1996	10265.1	1338	90.7	88.3	88.5	87.7	87.3	82.3	7989	90.9
1997	10906.4	1365	94.1	88.9	94.1	88.4	91.2	83.3	8258	94.3
1998	10758.1	1365	93.6	89.4	93.6	88.9	90.0	83.9	8356	95.4
1999	11610.9	1380	96.5	90.0	96.5	89.5	96.0	85.0	8465	96.6
2000	11291.1	1400	94.5	90.4	94.5	89.9	91.8	85.5	8311	94.6
2001	11731.3	1400	97.1	90.9	97.1	90.5	95.7	86.3	8506	97.1
2002	11512.2	1400	95.1	91.2	95.1	90.8	93.9	86.8	8350	95.3
2003	11671.6	1400	96.7	91.5	95.9	91.1	95.2	87.4	8491	96.9
2004	11595.3	1400	95.4	91.8	95.4	91.4	94.3	87.8	8395	95.6
2005	11102.6	1400	90.9	91.7	90.5	91.4	90.5	88.0	7976	91.1
2006	11755.3	1400	96.8	92.0	96.6	91.6	95.9	88.4	8494	97.0
2007	11377.5	1400	93.4	92.1	93.1	91.7	92.8	88.6	8200	93.6
2008	11456.2	1400	93.3	92.1	93.1	91.8	93.2	88.9	8217	93.5
2009	11484.9	1410	94.3	92.2	94.3	91.9	93.4	89.1	8277	94.5
2010	11375.3	1410	93.0	92.3	93.0	92.0	92.1	89.2	8162	93.2

2011	11655.8	1410	95.5	92.4	95.5	92.1	94.4	89.4	8378	95.6
2012	11385.0	1410	94.3	92.5	94.3	92.2	91.9	89.5	8299	94.5
2013	11402.1	1410	94.3	92.6	94.3	92.3	92.3	89.6	8400	95.9
2014	10794.9	1410	90.5	92.5	90.5	92.2	87.4	89.6	8350	95.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		24			64	
B. Refuelling without a maintenance				13		
C. Inspection, maintenance or repair combined with refuelling	386			465	8	
D. Inspection, maintenance or repair without refuelling				0		
E. Testing of plant systems or components				0	1	
L. Human factor related					9	
Z. Other					1	
Subtotal	386	24	0	478	83	0
Total		410			561	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		10
15. Reactor Cooling Systems		15
17. Safety I&C Systems (excluding reactor I&C)	16	
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		0
41. Main Generator Systems		34
42. Electrical Power Supply Systems	8	0
Total	24	62



## DE-44 NECKARWESTHEIM-2

Operator: EnKK (EnBW Kernkraft GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1310.0 MW(e)  
 Design Net Capacity: 1225.0 MW(e)  
 Design Discharge Burnup: 46000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 10535.8 GW(e)·h  
 Energy Availability Factor: 92.9%  
 Load Factor: 91.8%  
 Operating Factor: 93.1%  
 Energy Unavailability Factor: 7.1%  
 Total Off-line Time: 601 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	977.8	883.4	942.8	938.1	968.2	932.0	955.1	955.1	138.9	947.8	917.3	979.1	10535.8
EAF (%)	99.9	100.0	100.0	100.0	100.0	99.9	99.5	100.0	15.5	98.6	100.0	99.9	92.9
UCF (%)	99.9	100.0	100.0	100.0	100.0	99.9	99.5	100.0	15.5	98.6	100.0	99.9	92.9
LF (%)	100.3	100.4	96.9	99.5	99.3	98.8	98.0	98.0	14.7	97.1	97.3	100.5	91.8
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	17.4	99.2	100.0	100.0	93.1
EUF (%)	0.1	0.0	0.0	0.0	0.0	0.1	0.5	0.0	84.5	1.4	0.0	0.1	7.1
PUF (%)	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	78.8	0.6	0.0	0.1	6.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	5.7	0.8	0.0	0.0	0.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ANNUALLY MAINTENANCE AND REFUELING FROM 2014-09-06 TO 2014-10-01

### 5. Historical Summary

Date of Construction Start: 09 Nov 1982      Lifetime Generation: 268154.0 GW(e)·h  
 Date of First Criticality: 29 Dec 1988      Cumulative Energy Availability Factor: 93.1%  
 Date of Grid Connection: 03 Jan 1989      Cumulative Load Factor: 92.1%  
 Date of Commercial Operation: 15 Apr 1989      Cumulative Unit Capability Factor: 93.3%  
    Cumulative Energy Unavailability Factor: 6.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	6810.0	1225	99.8	99.8	99.8	99.8	84.2	84.2	6254	94.7
1990	9693.9	1225	90.2	94.3	90.2	94.3	90.3	87.7	7958	90.8
1991	9434.9	1225	90.5	92.9	90.5	92.9	87.9	87.8	7932	90.5
1992	10204.6	1269	91.6	92.6	91.6	92.6	91.5	88.8	8094	92.1
1993	9912.2	1269	89.0	91.8	89.0	91.8	89.2	88.9	8163	93.2
1994	10320.7	1269	93.6	92.1	93.6	92.1	92.8	89.6	8215	93.8
1995	10532.0	1269	94.7	92.5	94.7	92.5	94.7	90.4	8351	95.3
1996	10614.3	1269	95.1	92.8	95.1	92.8	95.2	91.0	8419	95.8
1997	10111.6	1269	91.5	92.7	91.5	92.7	91.0	91.0	8028	91.6
1998	10610.8	1269	96.0	93.0	96.0	93.0	95.5	91.5	8411	96.0
1999	10460.9	1269	96.1	93.3	96.1	93.3	94.1	91.7	8435	96.3
2000	10473.9	1269	96.2	93.6	96.2	93.6	94.0	91.9	8450	96.2
2001	10423.9	1269	95.4	93.7	94.2	93.6	93.8	92.0	8363	95.5
2002	9787.5	1269	88.7	93.3	88.7	93.3	88.0	91.8	7777	88.8
2003	10545.0	1269	95.8	93.5	95.8	93.4	94.9	92.0	8408	96.0
2004	10470.7	1269	92.9	93.5	92.9	93.4	93.9	92.1	8165	93.0
2005	10836.4	1305	95.4	93.6	94.8	93.5	94.8	92.3	8371	95.6
2006	10877.5	1305	95.9	93.7	95.4	93.6	95.2	92.4	8405	95.9
2007	10411.1	1310	91.1	93.6	91.1	93.5	90.7	92.3	8002	91.3
2008	10701.9	1310	93.5	93.6	93.3	93.4	93.0	92.4	8245	93.9
2009	10779.7	1310	94.7	93.6	94.6	93.5	93.9	92.4	8307	94.8
2010	10180.1	1310	89.5	93.4	88.6	93.3	88.7	92.3	7864	89.8
2011	10807.8	1310	95.0	93.5	94.9	93.3	94.2	92.4	8319	95.0

2012	10424.2	1310	91.8	93.4	91.8	93.3	90.6	92.3	8098	92.2
2013	10218.8	1310	90.1	93.3	90.1	93.1	89.0	92.1	7906	90.3
2014	10535.8	1310	92.9	93.3	92.9	93.1	91.8	92.1	8159	93.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		47			13	
C. Inspection, maintenance or repair combined with refuelling	554			481		
L. Human factor related					16	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					13	
Subtotal	554	47	0	481	42	0
Total		601			523	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems		3
32. Feedwater and Main Steam System		0
41. Main Generator Systems	47	0
Total	47	12

**DE-24 PHILIPPSBURG-2****Operator:** EnKK (EnBW Kernkraft GmbH)**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1402.0 MW(e)

**Design Net Capacity:** 1268.0 MW(e)

**Design Discharge Burnup:** 33000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 9631.5 GW(e)·h

**Energy Availability Factor:** 82.0%

**Load Factor:** 78.4%

**Operating Factor:** 82.2%

**Energy Unavailability Factor:** 18.0%

**Total Off-line Time:** 1563 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	1022.5	926.6	1015.2	985.8	942.0	497.0	0.0	217.5	987.7	1025.8	990.7	1020.7	9631.5
<b>EAF (%)</b>	99.9	100.0	100.0	99.7	99.5	66.7	0.0	21.5	100.0	99.9	100.0	99.9	82.0
<b>UCF (%)</b>	99.9	100.0	100.0	99.7	99.5	66.7	0.0	21.5	100.0	100.0	100.0	99.9	82.0
<b>LF (%)</b>	98.0	98.4	97.5	97.7	90.3	49.2	0.0	20.9	97.8	98.2	98.1	97.9	78.4
<b>OF (%)</b>	100.0	100.0	100.0	100.0	99.9	67.1	0.0	21.9	100.0	100.0	100.0	100.0	82.2
<b>EUf (%)</b>	0.1	0.0	0.0	0.3	0.5	33.3	100.0	78.5	0.0	0.1	0.0	0.1	18.0
<b>PUf (%)</b>	0.1	0.0	0.0	0.3	0.0	33.3	100.0	22.9	0.0	0.1	0.0	0.1	13.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.5	0.0	0.0	55.7	0.0	0.0	0.0	0.0	4.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

ANNUALLY MAINTENANCE AND REFUELING FROM 2014-06-21 TO 2014-08-25

**5. Historical Summary**

**Date of Construction Start:** 07 Jul 1977      **Lifetime Generation:** 309055.0 GW(e)·h

**Date of First Criticality:** 13 Dec 1984      **Cumulative Energy Availability Factor:** 88.5%

**Date of Grid Connection:** 17 Dec 1984      **Cumulative Load Factor:** 87.4%

**Date of Commercial Operation:** 18 Apr 1985      **Cumulative Unit Capability Factor:** 89.5%

**Cumulative Energy Unavailability Factor:** 11.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	7930.0	1268	95.0	95.0	95.0	95.0	94.7	94.7	6411	97.1
1986	10235.3	1268	90.6	92.5	90.6	92.5	92.1	93.3	7958	90.8
1987	9616.2	1268	85.0	89.8	85.0	89.8	86.6	90.8	7446	85.0
1988	9710.8	1268	86.5	88.9	86.5	88.9	87.2	89.9	7656	87.2
1989	9677.3	1268	86.2	88.3	86.2	88.3	87.1	89.3	7575	86.5
1990	8516.3	1268	75.5	86.1	75.5	86.1	76.7	87.1	6628	75.7
1991	9903.3	1268	88.4	86.4	88.0	86.4	89.1	87.4	7757	88.6
1992	9400.0	1285	82.2	85.9	82.2	85.8	83.3	86.9	7273	82.8
1993	10481.3	1324	90.5	86.4	90.5	86.4	90.4	87.3	7946	90.7
1994	10284.8	1336	88.7	86.7	88.7	86.6	87.9	87.3	7778	88.8
1995	10550.5	1336	91.0	87.1	91.0	87.0	90.1	87.6	7990	91.2
1996	11217.6	1358	94.7	87.8	94.7	87.7	94.0	88.2	8323	94.8
1997	11113.5	1358	95.3	88.4	95.3	88.4	93.4	88.6	8358	95.4
1998	10731.5	1358	93.0	88.7	93.0	88.7	90.2	88.7	8304	94.8
1999	11122.9	1358	96.1	89.3	96.1	89.2	93.5	89.1	8431	96.2
2000	10689.1	1363	92.2	89.5	92.2	89.4	89.2	89.1	8115	92.4
2001	8995.8	1392	96.0	89.9	76.6	88.6	73.8	88.1	6749	77.0
2002	11053.2	1392	92.4	90.0	92.4	88.8	90.6	88.3	8138	92.9
2003	11010.2	1392	93.5	90.2	93.5	89.1	90.3	88.4	8234	94.0
2004	10295.0	1392	86.9	90.0	86.9	89.0	84.2	88.2	7641	87.0
2005	10823.4	1392	92.3	90.2	89.3	89.0	88.8	88.2	8099	92.5
2006	10956.2	1392	92.8	90.3	91.2	89.1	89.8	88.3	8138	92.9
2007	11172.9	1392	94.1	90.5	92.1	89.2	91.6	88.4	8254	94.2

2008	10840.8	1392	90.3	90.4	88.7	89.2	88.7	88.4	7953	90.5
2009	10969.6	1392	92.3	90.5	92.3	89.3	90.0	88.5	8104	92.5
2010	11192.1	1402	92.8	90.6	91.6	89.4	91.1	88.6	8146	93.0
2011	10727.2	1402	90.1	90.6	89.0	89.4	87.3	88.6	7901	90.2
2012	10227.8	1402	85.5	90.4	85.5	89.3	83.1	88.3	7523	85.6
2013	8714.5	1402	73.1	89.8	73.1	88.7	71.0	87.7	6422	73.3
2014	9631.5	1402	82.0	89.5	82.0	88.5	78.4	87.4	7197	82.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		415			127	
C. Inspection, maintenance or repair combined with refuelling	1148			667	2	
D. Inspection, maintenance or repair without refuelling				39		
E. Testing of plant systems or components				0		
Z. Other					14	55
Subtotal	1148	415	0	706	143	55
Total		1563			904	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems		4
15. Reactor Cooling Systems		42
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	1	0
32. Feedwater and Main Steam System		2
41. Main Generator Systems		10
42. Electrical Power Supply Systems	414	47
Total	415	125

# HU-1 PAKS-1

**Operator:** PAKS Zrt (PAKS NUCLEAR POWER PLANT LTD)

**Contractor:** AEE (ATOMENERGOEXPORT)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 470.0 MW(e)  
**Design Net Capacity:** 408.0 MW(e)  
**Design Discharge Burnup:** 37000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 3787.5 GW(e)·h  
**Energy Availability Factor:** 90.5%  
**Load Factor:** 92.0%  
**Operating Factor:** 91.6%  
**Energy Unavailability Factor:** 9.5%  
**Total Off-line Time:** 738 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	353.7	325.3	318.6	22.4	342.2	336.5	344.9	346.5	341.9	354.9	339.3	361.4	3787.5
<b>EAF (%)</b>	98.2	100.0	88.2	6.1	96.9	99.4	98.7	99.7	100.0	100.0	98.2	99.8	90.5
<b>UCF (%)</b>	98.2	100.0	88.2	6.1	96.9	100.0	100.0	100.0	100.0	100.0	98.2	99.8	90.7
<b>LF (%)</b>	101.1	103.0	91.2	6.6	97.8	99.4	98.6	99.1	101.0	101.4	100.3	103.4	92.0
<b>OF (%)</b>	99.3	100.0	90.2	9.9	99.5	100.0	100.0	100.0	100.0	100.0	99.0	100.0	91.6
<b>EUf (%)</b>	1.8	0.0	11.8	93.9	3.1	0.6	1.3	0.3	0.0	0.0	1.8	0.2	9.5
<b>PUf (%)</b>	0.0	0.0	9.9	85.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8
<b>UCLF (%)</b>	1.8	0.0	1.9	8.9	3.1	0.0	0.0	0.0	0.0	0.0	1.8	0.2	1.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.6	1.3	0.3	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1974  
**Date of First Criticality:** 14 Dec 1982  
**Date of Grid Connection:** 28 Dec 1982  
**Date of Commercial Operation:** 10 Aug 1983

**Lifetime Generation:** 105449.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 86.4%  
**Cumulative Load Factor:** 87.2%  
**Cumulative Unit Capability Factor:** 86.4%  
**Cumulative Energy Unavailability Factor:** 13.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	1370.0	410	91.0	91.0	91.0	91.0	91.0	91.0	3662	99.7
1984	2595.3	403	75.7	80.3	75.6	80.2	73.3	78.5	6901	78.6
1985	2997.3	410	84.2	81.9	84.2	81.9	83.5	80.6	7491	85.5
1986	3114.6	410	87.1	83.4	87.1	83.4	86.7	82.4	7718	88.1
1987	2883.1	415	79.2	82.5	79.2	82.4	79.3	81.7	7107	81.1
1988	3076.9	415	85.8	83.1	85.8	83.1	84.4	82.2	7737	88.1
1989	3182.2	415	87.7	83.8	87.7	83.8	87.5	83.0	7929	90.5
1990	3216.8	415	87.2	84.3	87.2	84.3	88.5	83.8	7837	89.5
1991	2883.9	410	75.1	83.2	75.1	83.2	80.3	83.4	6823	77.9
1992	3498.9	430	84.9	83.4	84.9	83.4	92.6	84.4	7629	86.9
1993	3512.4	430	85.8	83.6	85.8	83.6	93.2	85.3	7637	87.2
1994	3441.5	430	89.9	84.2	89.8	84.2	91.4	85.8	8031	91.7
1995	3056.3	430	79.6	83.8	79.5	83.8	81.1	85.4	7088	80.9
1996	3472.7	430	90.7	84.3	90.6	84.3	91.9	85.9	8033	91.5
1997	3328.5	430	87.0	84.5	86.9	84.5	88.4	86.1	7646	87.3
1998	3487.7	430	92.4	85.1	92.4	85.0	92.6	86.5	8095	92.4
1999	3117.5	430	81.6	84.8	81.2	84.8	82.8	86.3	7240	82.6
2000	3192.1	430	82.5	84.7	82.3	84.6	84.5	86.2	7268	82.7
2001	3514.9	437	91.8	85.1	91.6	85.0	91.8	86.5	8069	92.1
2002	3330.7	437	90.2	85.4	90.1	85.3	87.0	86.5	7909	90.3
2003	3097.8	437	81.0	85.1	81.0	85.1	80.9	86.3	7197	82.1
2004	3342.3	437	87.1	85.2	87.1	85.2	87.1	86.3	7692	87.6
2005	3503.5	437	91.5	85.5	91.5	85.5	91.5	86.5	8029	91.7

2006	3468.5	437	90.8	85.8	90.8	85.7	90.6	86.7	7979	91.1
2007	3179.4	470	79.7	85.5	79.7	85.4	79.7	86.4	6933	79.1
2008	3670.3	470	88.9	85.6	88.9	85.6	88.9	86.5	7824	89.1
2009	3708.0	470	90.2	85.8	90.2	85.8	90.1	86.7	7926	90.5
2010	3762.0	470	91.5	86.1	91.5	86.0	91.4	86.8	8031	91.7
2011	3422.1	470	83.1	85.9	83.1	85.9	83.1	86.7	7291	83.2
2012	3697.0	470	89.6	86.1	89.6	86.0	89.5	86.8	7881	89.7
2013	3834.7	470	91.4	86.3	91.3	86.2	93.1	87.0	8009	91.4
2014	3787.5	470	90.7	86.4	90.5	86.4	92.0	87.2	8022	91.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		67			83	
C. Inspection, maintenance or repair combined with refuelling	673			939	21	
D. Inspection, maintenance or repair without refuelling				17		
E. Testing of plant systems or components					0	
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					0	
Z. Other					11	
Subtotal	673	67	0	956	115	0
Total		740			1071	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		5
14. Safety Systems		4
15. Reactor Cooling Systems	49	3
16. Steam generation systems		10
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	7	9
32. Feedwater and Main Steam System		9
33. Circulating Water System		8
35. All other I&C Systems		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems	11	3
XX. Miscellaneous Systems		11
Total	67	76

## HU-2 PAKS-2

**Operator:** PAKS Zrt (PAKS NUCLEAR POWER PLANT LTD)

**Contractor:** AEE (ATOMENERGOEXPORT)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 473.0 MW(e)  
**Design Net Capacity:** 410.0 MW(e)  
**Design Discharge Burnup:** 37000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 3903.0 GW(e)·h  
**Energy Availability Factor:** 92.4%  
**Load Factor:** 94.2%  
**Operating Factor:** 92.8%  
**Energy Unavailability Factor:** 7.6%  
**Total Off-line Time:** 633 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	362.2	328.0	360.6	341.8	356.1	341.7	202.7	187.2	348.4	360.8	351.2	362.2	3903.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	99.9	100.0	57.6	53.2	100.0	100.0	100.0	100.0	92.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	99.9	100.0	58.2	53.6	100.0	100.0	100.0	100.0	92.5
<b>LF (%)</b>	102.9	103.2	102.6	100.4	101.2	100.3	57.6	53.2	102.3	102.4	103.1	102.9	94.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	58.2	56.7	100.0	100.0	100.0	100.0	92.8
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.1	0.0	42.4	46.8	0.0	0.0	0.0	0.0	7.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	41.8	45.2	0.0	0.0	0.0	0.0	7.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.4	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1974  
**Date of First Criticality:** 26 Aug 1984  
**Date of Grid Connection:** 06 Sep 1984  
**Date of Commercial Operation:** 14 Nov 1984

**Lifetime Generation:** 95486.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 81.2%  
**Cumulative Load Factor:** 82.1%  
**Cumulative Unit Capability Factor:** 81.3%  
**Cumulative Energy Unavailability Factor:** 18.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	584.2	425	94.1	94.1	94.1	94.1	97.3	97.3	1456	99.5
1985	3101.6	415	85.1	86.4	85.1	86.4	85.3	87.0	7695	87.8
1986	3148.3	415	86.0	86.2	86.0	86.2	86.6	86.8	7643	87.2
1987	3193.9	415	85.3	85.9	85.3	85.9	87.9	87.2	7770	88.7
1988	3046.3	415	81.9	85.0	81.9	85.0	83.6	86.3	7352	83.7
1989	3300.7	415	88.6	85.7	88.6	85.7	90.8	87.2	7962	90.9
1990	3338.2	425	88.0	86.1	88.0	86.1	89.7	87.6	7845	89.6
1991	3421.6	415	88.6	86.4	88.6	86.4	94.1	88.5	7912	90.3
1992	3174.9	433	76.0	85.1	76.0	85.1	83.5	87.8	6829	77.7
1993	3569.0	433	87.0	85.3	87.0	85.3	94.1	88.6	7731	88.3
1994	3440.4	433	89.5	85.7	89.4	85.7	90.7	88.8	8000	91.3
1995	3309.1	433	86.6	85.8	86.4	85.8	87.2	88.6	7657	87.4
1996	3019.9	433	79.5	85.3	79.4	85.3	79.4	87.8	7011	79.8
1997	3267.6	433	88.3	85.5	88.2	85.5	86.1	87.7	7807	89.1
1998	3206.7	433	88.3	85.7	88.2	85.7	84.5	87.5	7717	88.1
1999	3246.6	433	90.2	86.0	89.2	85.9	85.6	87.4	7780	88.8
2000	3059.3	433	80.1	85.6	80.0	85.5	80.4	86.9	7073	80.5
2001	3266.9	441	84.9	85.6	84.8	85.5	84.6	86.8	7484	85.4
2002	3338.5	441	86.7	85.7	86.5	85.6	86.4	86.8	7644	87.3
2003	918.8	441	23.8	82.3	23.8	82.2	23.8	83.4	2089	23.8
2004	1137.2	441	29.4	79.6	29.4	79.5	29.4	80.6	2620	29.8
2005	2929.5	441	75.8	79.4	75.8	79.4	75.8	80.4	6669	76.1
2006	2399.6	441	62.6	78.7	62.3	78.6	62.1	79.5	5493	62.7

2007	3477.0	443	89.2	79.1	89.2	79.0	89.6	80.0	7887	90.0
2008	2993.8	473	76.3	79.0	76.2	78.9	76.5	79.8	6669	75.9
2009	3772.5	473	91.1	79.5	91.1	79.4	91.0	80.3	7985	91.2
2010	3715.8	473	89.7	80.0	89.7	79.9	89.7	80.7	7892	90.1
2011	3770.5	473	91.0	80.4	91.0	80.3	91.0	81.1	7978	91.1
2012	3521.4	473	84.8	80.6	84.8	80.5	84.8	81.3	7456	84.9
2013	3794.7	473	90.3	80.9	89.7	80.8	91.6	81.6	7905	90.2
2014	3903.0	473	92.5	81.3	92.4	81.2	94.2	82.1	8127	92.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					459	
C. Inspection, maintenance or repair combined with refuelling	632			915	14	
D. Inspection, maintenance or repair without refuelling				81		
E. Testing of plant systems or components				1	0	
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					18	
Z. Other					21	
Subtotal	632	0	0	997	512	0
Total	632			1509		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		184
12. Reactor I&C Systems		22
15. Reactor Cooling Systems		9
16. Steam generation systems		16
17. Safety I&C Systems (excluding reactor I&C)		16
21. Fuel Handling and Storage Facilities		188
31. Turbine and auxiliaries		14
32. Feedwater and Main Steam System		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		3
Total	0	454



## HU-3 PAKS-3

Operator: PAKS Zrt (PAKS NUCLEAR POWER PLANT LTD)

Contractor: AEE (ATOMENERGOEXPORT)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 473.0 MW(e)

Design Net Capacity: 410.0 MW(e)

Design Discharge Burnup: 37000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3598.7 GW(e)·h

Energy Availability Factor: 86.0%

Load Factor: 86.9%

Operating Factor: 87.0%

Energy Unavailability Factor: 14.0%

Total Off-line Time: 1140 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	230.6	326.8	358.1	340.8	352.5	267.4	345.7	347.4	341.3	32.0	294.3	361.8	3598.7
EAF (%)	64.5	100.0	100.0	100.0	100.0	78.5	98.3	98.8	100.0	9.7	84.6	100.0	86.0
UCF (%)	64.5	100.0	100.0	100.0	100.0	78.8	100.0	100.0	100.0	9.7	84.6	100.0	86.3
LF (%)	65.5	102.8	101.9	100.1	100.2	78.5	98.2	98.7	100.2	9.1	86.4	102.8	86.9
OF (%)	67.6	100.0	100.0	100.0	100.0	80.7	100.0	100.0	100.0	10.3	87.2	100.0	87.0
EUUF (%)	35.5	0.0	0.0	0.0	0.0	21.5	1.7	1.2	0.0	90.3	15.4	0.0	14.0
PUF (%)	0.0	0.0	0.0	0.0	0.0	21.2	0.0	0.0	0.0	90.3	3.4	0.0	9.7
UCLF (%)	35.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	4.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.3	1.7	1.2	0.0	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE

### 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 94090.0 GW(e)·h

Date of First Criticality: 15 Sep 1986      Cumulative Energy Availability Factor: 86.3%

Date of Grid Connection: 28 Sep 1986      Cumulative Load Factor: 87.0%

Date of Commercial Operation: 01 Dec 1986      Cumulative Unit Capability Factor: 86.7%

Cumulative Energy Unavailability Factor: 13.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	314.1	427	99.6	99.6	99.6	99.6	101.7	101.7	744	100.0
1987	3209.6	415	87.0	87.9	87.0	87.9	88.3	89.3	7648	87.3
1988	3300.9	415	88.1	88.0	88.1	88.0	90.6	89.9	7874	89.6
1989	3140.5	415	82.4	86.2	82.4	86.2	86.4	88.8	7343	83.8
1990	3273.4	435	85.6	86.1	85.6	86.1	85.9	88.0	7755	88.5
1991	3256.0	410	84.2	85.7	84.2	85.7	90.7	88.6	7580	86.5
1992	3587.3	433	87.7	86.0	87.5	86.0	94.3	89.5	7852	89.4
1993	3177.9	433	77.6	84.8	77.4	84.8	83.8	88.7	6950	79.3
1994	3376.0	433	88.6	85.3	88.5	85.2	89.0	88.7	7884	90.0
1995	3392.8	433	89.2	85.7	89.0	85.7	89.4	88.8	7911	90.3
1996	3429.4	433	90.9	86.3	90.8	86.2	90.2	89.0	8136	92.6
1997	3066.1	433	81.1	85.8	80.9	85.7	80.8	88.2	7136	81.5
1998	3294.1	433	88.0	86.0	88.0	85.9	86.8	88.1	7566	86.4
1999	3445.7	433	92.3	86.5	92.2	86.4	90.8	88.3	8058	92.0
2000	3517.3	433	93.0	86.9	92.8	86.8	92.5	88.6	8163	92.9
2001	3040.4	433	80.7	86.5	80.3	86.4	80.2	88.0	7159	81.7
2002	3256.8	433	90.5	86.8	90.4	86.6	85.9	87.9	7900	90.2
2003	3008.3	433	87.8	86.8	80.5	86.3	79.3	87.4	7746	88.4
2004	3333.3	433	87.6	86.9	87.6	86.4	87.6	87.4	7732	88.0
2005	3038.7	433	80.1	86.5	80.1	86.0	80.1	87.0	7088	80.9
2006	3454.9	433	91.2	86.8	91.2	86.3	91.1	87.2	8007	91.4
2007	3396.0	443	87.5	86.8	87.5	86.3	87.5	87.2	7691	87.8
2008	3530.4	443	90.7	87.0	90.6	86.5	90.7	87.4	7962	90.6

2009	3174.0	473	80.9	86.7	80.9	86.3	80.9	87.1	7078	80.8
2010	3831.5	473	92.5	87.0	92.5	86.6	92.5	87.4	8123	92.7
2011	3688.7	473	89.0	87.1	89.0	86.7	89.0	87.4	7823	89.3
2012	3803.6	473	91.6	87.2	91.6	86.9	91.5	87.6	8080	92.0
2013	3054.6	473	73.9	86.7	73.2	86.3	73.7	87.0	6480	74.0
2014	3598.7	473	86.3	86.7	86.0	86.3	86.9	87.0	7620	87.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		308			136	
C. Inspection, maintenance or repair combined with refuelling	694			894	95	
D. Inspection, maintenance or repair without refuelling	138			18		
E. Testing of plant systems or components				1	4	
L. Human factor related					0	
Z. Other					8	
Subtotal	832	308	0	913	243	0
Total		1140			1156	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		33
13. Reactor Auxiliary Systems	68	
14. Safety Systems		0
15. Reactor Cooling Systems		0
16. Steam generation systems		1
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities	240	29
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		16
42. Electrical Power Supply Systems		28
XX. Miscellaneous Systems		7
Total	308	132

## HU-4 PAKS-4

Operator: PAKS Zrt (PAKS NUCLEAR POWER PLANT LTD)

Contractor: AEE (ATOMENERGOEXPORT)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 473.0 MW(e)

Design Net Capacity: 410.0 MW(e)

Design Discharge Burnup: 37000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3488.6 GW(e)·h

Energy Availability Factor: 83.5%

Load Factor: 84.2%

Operating Factor: 84.8%

Energy Unavailability Factor: 16.5%

Total Off-line Time: 1330 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	358.3	323.6	358.0	341.1	20.7	27.2	339.2	331.1	337.7	348.9	344.9	357.7	3488.6
EAF (%)	100.0	100.0	100.0	100.0	5.9	8.0	96.4	94.6	99.2	99.0	100.0	100.0	83.5
UCF (%)	100.0	100.0	100.0	100.0	8.0	10.7	98.8	96.1	99.5	99.0	100.0	100.0	84.3
LF (%)	101.8	101.8	101.9	100.2	5.9	8.0	96.4	94.1	99.2	99.0	101.3	101.7	84.2
OF (%)	100.0	100.0	100.0	100.0	6.6	11.8	100.0	100.0	100.0	100.0	100.0	100.0	84.8
EUf (%)	0.0	0.0	0.0	0.0	94.1	92.0	3.6	5.4	0.8	1.0	0.0	0.0	16.5
PUf (%)	0.0	0.0	0.0	0.0	92.0	89.4	0.0	0.0	0.0	0.0	0.0	0.0	15.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	1.2	3.9	0.5	1.0	0.0	0.0	0.6
XUF (%)	0.0	0.0	0.0	0.0	2.1	2.7	2.4	1.5	0.4	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE

### 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 94288.0 GW(e)·h

Date of First Criticality: 09 Aug 1987      Cumulative Energy Availability Factor: 87.7%

Date of Grid Connection: 16 Aug 1987      Cumulative Load Factor: 88.9%

Date of Commercial Operation: 01 Nov 1987      Cumulative Unit Capability Factor: 87.9%

Cumulative Energy Unavailability Factor: 12.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	618.3	425	100.0	100.0	100.0	100.0	101.8	101.8	1464	100.0
1988	3200.9	415	85.6	87.7	85.6	87.7	87.8	89.8	7564	86.1
1989	3425.3	415	89.7	88.6	89.7	88.6	94.2	91.8	7974	91.0
1990	3064.5	435	76.7	84.7	76.7	84.7	80.4	88.1	7253	82.8
1991	3343.0	410	86.5	85.2	86.5	85.2	93.1	89.3	7787	88.9
1992	3702.8	433	90.9	86.3	90.7	86.3	97.4	90.9	8082	92.0
1993	3537.2	430	87.5	86.5	87.0	86.4	93.9	91.4	7767	88.7
1994	2971.2	433	78.1	85.3	78.1	85.2	78.3	89.5	7019	80.1
1995	3443.8	433	90.8	86.0	90.4	85.9	90.8	89.7	8049	91.9
1996	3487.5	433	91.3	86.6	90.7	86.4	91.7	89.9	8087	92.1
1997	3487.1	433	92.0	87.1	91.6	86.9	91.9	90.1	8098	92.4
1998	3136.1	433	84.3	86.9	83.7	86.6	82.7	89.4	7389	84.3
1999	3464.0	433	89.3	87.1	89.3	86.8	91.3	89.6	8046	91.8
2000	3578.4	433	92.3	87.5	92.2	87.3	94.1	89.9	8116	92.4
2001	3471.7	444	90.1	87.7	90.0	87.5	89.3	89.9	7916	90.4
2002	3182.9	444	83.4	87.4	83.1	87.2	81.8	89.3	7287	83.2
2003	3607.6	444	93.0	87.7	92.8	87.5	92.8	89.6	8119	92.7
2004	3396.6	444	87.1	87.7	87.1	87.5	87.1	89.4	7878	89.7
2005	3548.8	444	91.2	87.9	91.2	87.7	91.2	89.5	8046	91.8
2006	3185.2	444	81.9	87.6	81.9	87.4	81.9	89.1	7196	82.1
2007	3810.4	473	92.0	87.8	92.0	87.6	92.0	89.3	8078	92.2
2008	3671.4	473	88.4	87.8	88.4	87.7	88.4	89.2	7854	89.4
2009	3643.1	473	88.0	87.8	88.0	87.7	87.9	89.2	7715	88.1

2010	3348.2	473	80.9	87.5	80.9	87.4	80.8	88.8	7091	80.9
2011	3825.6	473	92.3	87.7	92.3	87.6	92.3	88.9	8103	92.5
2012	3741.4	473	90.1	87.8	90.1	87.7	90.1	89.0	7961	90.6
2013	3853.5	473	92.1	88.0	91.7	87.9	93.0	89.1	8076	92.2
2014	3488.6	473	84.3	87.9	83.5	87.7	84.2	88.9	7430	84.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					70	
C. Inspection, maintenance or repair combined with refuelling	1329			842	20	
D. Inspection, maintenance or repair without refuelling				5		
E. Testing of plant systems or components				1		
L. Human factor related					2	
Z. Other				2	3	
Subtotal	1329	0	0	850	95	0
Total	1329			945		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		12
15. Reactor Cooling Systems		12
16. Steam generation systems		18
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		14
32. Feedwater and Main Steam System		4
41. Main Generator Systems		0
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		5
Total	0	67

## IN-13 KAIGA-1

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 6700 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1433.1 GW(e)·h  
**Energy Availability Factor:** 82.0%  
**Load Factor:** 81.0%  
**Operating Factor:** 99.9%  
**Energy Unavailability Factor:** 18.0%  
**Total Off-line Time:** 9 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	101.5	103.6	121.1	115.3	121.7	117.2	119.4	120.6	115.8	127.1	132.2	137.7	1433.1
<b>EAF (%)</b>	68.5	77.3	81.6	80.3	82.0	81.6	80.5	81.2	80.6	85.5	91.9	92.6	82.0
<b>UCF (%)</b>	100.0	100.0	100.0	98.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9
<b>LF (%)</b>	67.5	76.3	80.6	79.3	81.0	80.6	79.5	80.2	79.6	84.6	90.9	91.6	81.0
<b>OF (%)</b>	100.0	100.0	100.0	98.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9
<b>EUf (%)</b>	31.5	22.7	18.4	19.7	18.0	18.4	19.5	18.8	19.4	14.5	8.1	7.4	18.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	31.5	22.7	18.4	18.5	18.0	18.4	19.5	18.8	19.4	14.5	8.1	7.4	17.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 99.9% 82.76% RESPECTIVELY. DURING THE YEAR UNIT OPERATED AT A REDUCED POWER LEVEL BETWEEN 70% TO 90% FULL POWER DUE TO MISMATCH IN FUEL DEMAND AND SUPPLY.

### 5. Historical Summary

**Date of Construction Start:** 01 Sep 1989 **Lifetime Generation:** 17236.8 GW(e)·h  
**Date of First Criticality:** 26 Sep 2000 **Cumulative Energy Availability Factor:** 70.5%  
**Date of Grid Connection:** 12 Oct 2000 **Cumulative Load Factor:** 69.2%  
**Date of Commercial Operation:** 16 Nov 2000 **Cumulative Unit Capability Factor:** 91.5%  
**Cumulative Energy Unavailability Factor:** 29.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2000	188.4	200	86.9	86.9	86.9	86.9	64.4	64.4	1037	70.8
2001	1241.1	200	75.8	77.4	70.4	72.8	70.8	69.9	6316	72.1
2002	1692.9	202	95.6	85.8	92.4	81.9	95.7	81.9	8082	92.3
2003	1336.0	202	87.5	86.4	83.4	82.4	75.5	79.8	7255	82.8
2004	1344.9	202	94.6	88.4	77.8	81.3	75.8	78.9	8181	93.1
2005	1183.6	202	88.9	88.5	66.5	78.4	66.9	76.5	7580	86.5
2006	1167.3	202	97.4	89.9	67.0	76.5	66.0	74.8	8524	97.3
2007	946.3	202	82.9	88.9	54.4	73.4	53.5	71.8	7250	82.8
2008	1103.0	202	100.0	90.3	63.2	72.2	62.2	70.7	8784	100.0
2009	842.1	202	79.6	89.1	48.6	69.6	47.6	68.1	6953	79.4
2010	998.5	202	97.5	89.9	57.4	68.4	56.4	67.0	8535	97.4
2011	1124.8	202	90.3	90.0	64.6	68.1	63.6	66.7	7900	90.2
2012	1303.3	202	99.3	90.7	74.4	68.6	73.5	67.2	8719	99.3
2013	1441.0	202	92.0	90.8	82.2	69.6	81.4	68.3	8049	91.9
2014	1433.1	202	99.9	91.5	82.0	70.5	81.0	69.2	8751	99.9

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2000 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		9			333	

D. Inspection, maintenance or repair without refuelling				295		
E. Testing of plant systems or components				7	0	
H. Nuclear regulatory requirements					16	
J. Grid limitation, failure or grid unavailability						105
L. Human factor related					12	
Z. Other					60	
Subtotal	0	9	0	302	421	105
Total	9			828		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2000 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		53
12. Reactor I&C Systems		24
13. Reactor Auxiliary Systems		3
14. Safety Systems		13
15. Reactor Cooling Systems		10
17. Safety I&C Systems (excluding reactor I&C)		14
31. Turbine and auxiliaries	9	43
32. Feedwater and Main Steam System		17
35. All other I&C Systems		0
41. Main Generator Systems		136
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems		6
Total	9	327

## IN-14 KAIGA-2

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP at the beginning of 2014):** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 6700 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1313.5 GW(e)·h  
**Energy Availability Factor:** 75.2%  
**Load Factor:** 74.2%  
**Operating Factor:** 91.1%  
**Energy Unavailability Factor:** 24.8%  
**Total Off-line Time:** 781 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	131.8	117.2	123.1	119.1	121.5	116.1	119.5	120.2	116.0	117.3	0.5	111.3	1313.5
<b>EAF (%)</b>	88.7	87.3	82.9	82.9	81.8	80.8	80.5	81.0	80.8	79.0	1.3	75.0	75.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	4.2	88.8	91.2
<b>LF (%)</b>	87.7	86.3	81.9	81.9	80.8	79.8	79.5	80.0	79.8	78.0	0.3	74.1	74.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	3.2	88.7	91.1
<b>EUf (%)</b>	11.3	12.7	17.1	17.1	18.2	19.2	19.5	19.0	19.2	21.0	98.7	25.0	24.8
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	95.8	11.2	8.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	11.3	12.7	17.1	17.1	18.2	19.2	19.5	19.0	19.2	21.0	2.9	13.8	16.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 91.09% AND 75.48% RESPECTIVELY. DURING THE YEAR UNIT OPERATED AT A REDUCED POWER LEVEL BETWEEN 75% TO 86% FULL POWER DUE TO MISMATCH IN FUEL DEMAND AND SUPPLY.

### 5. Historical Summary

**Date of Construction Start:** 01 Dec 1989 **Lifetime Generation:** 17965.1 GW(e)·h  
**Date of First Criticality:** 24 Sep 1999 **Cumulative Energy Availability Factor:** 70.0%  
**Date of Grid Connection:** 02 Dec 1999 **Cumulative Load Factor:** 68.7%  
**Date of Commercial Operation:** 16 Mar 2000 **Cumulative Unit Capability Factor:** 90.5%  
**Cumulative Energy Unavailability Factor:** 30.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2000	1036.0	200	76.9	76.9	76.9	76.9	70.5	70.5	5428	73.9
2001	1308.6	200	82.1	79.7	74.2	75.5	74.7	72.8	6670	76.1
2002	1559.2	202	87.5	82.5	85.8	79.1	88.1	78.2	7455	85.1
2003	1413.0	202	88.7	84.1	86.9	81.2	79.9	78.7	7535	86.0
2004	1290.2	202	91.0	85.6	74.7	79.8	72.7	77.4	7732	88.0
2005	1509.4	202	96.4	87.4	82.9	80.4	85.3	78.8	8428	96.2
2006	1064.2	202	89.2	87.7	61.1	77.5	60.1	76.0	7806	89.1
2007	1083.1	202	100.0	89.3	62.2	75.6	61.2	74.1	8757	100.0
2008	816.5	202	85.5	88.8	47.0	72.3	46.0	70.9	7040	80.1
2009	970.0	202	98.1	89.8	55.8	70.6	54.8	69.3	8589	98.0
2010	794.7	202	80.5	88.9	45.9	68.4	44.9	67.1	7031	80.3
2011	1193.3	202	99.2	89.8	71.0	68.6	67.4	67.1	8466	96.6
2012	1129.2	202	90.5	89.8	64.6	68.3	63.6	66.8	7940	90.4
2013	1533.5	202	98.3	90.5	87.7	69.7	86.7	68.3	8613	98.3
2014	1313.5	202	91.2	90.5	75.2	70.0	74.2	68.7	7979	91.1

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2000 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					458	

D. Inspection, maintenance or repair without refuelling	780			336	1	
E. Testing of plant systems or components					1	
J. Grid limitation, failure or grid unavailability						120
L. Human factor related					12	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						30
Z. Other					3	
Subtotal	780	0	0	336	475	150
Total	780			961		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2000 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		90
13. Reactor Auxiliary Systems		6
15. Reactor Cooling Systems		42
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		24
31. Turbine and auxiliaries		205
32. Feedwater and Main Steam System		24
41. Main Generator Systems		16
42. Electrical Power Supply Systems		32
XX. Miscellaneous Systems		3
Total	0	452



## IN-15 KAIGA-3

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1398.9 GW(e)·h  
**Energy Availability Factor:** 80.0%  
**Load Factor:** 79.1%  
**Operating Factor:** 88.7%  
**Energy Unavailability Factor:** 20.0%  
**Total Off-line Time:** 992 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	131.2	118.4	130.0	121.2	144.7	30.5	108.9	116.0	127.1	135.5	133.4	101.9	1398.9
<b>EAF (%)</b>	88.3	88.2	87.5	84.3	97.3	22.0	73.4	78.2	88.4	91.2	92.7	68.8	80.0
<b>UCF (%)</b>	100.0	100.0	100.0	93.5	100.0	24.0	84.1	90.0	100.0	100.0	100.0	73.8	88.8
<b>LF (%)</b>	87.3	87.2	86.5	83.4	96.3	21.0	72.4	77.2	87.4	90.2	91.7	67.8	79.1
<b>OF (%)</b>	100.0	100.0	100.0	93.5	100.0	23.2	83.9	89.9	100.0	100.0	100.0	73.5	88.7
<b>EUf (%)</b>	11.7	11.8	12.5	15.7	2.7	78.0	26.6	21.8	11.6	8.8	7.3	31.2	20.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	76.0	16.0	10.0	0.0	0.0	0.0	0.0	8.4
<b>UCLF (%)</b>	0.0	0.0	0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.2	2.8
<b>XUF (%)</b>	11.7	11.8	12.5	9.2	2.7	2.0	10.6	11.8	11.6	8.8	7.3	5.0	8.7

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 96.92% AND 80.09% RESPECTIVELY. DURING THE YEAR UNIT OPERATED AT A REDUCED POWER LEVEL BETWEEN 80% AND 88% DUE TO MISMATCH IN FUEL DEMAND AND SUPPLY.

### 5. Historical Summary

**Date of Construction Start:** 30 Mar 2002 **Lifetime Generation:** 7879.4 GW(e)·h  
**Date of First Criticality:** 26 Feb 2007 **Cumulative Energy Availability Factor:** 58.9%  
**Date of Grid Connection:** 11 Apr 2007 **Cumulative Load Factor:** 58.0%  
**Date of Commercial Operation:** 06 May 2007 **Cumulative Unit Capability Factor:** 81.0%  
**Cumulative Energy Unavailability Factor:** 41.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2007	348.4	202	34.8	34.8	29.9	29.9	29.3	29.3	2008	34.1
2008	372.0	202	63.9	52.2	22.0	25.1	21.0	24.3	2532	28.8
2009	745.4	202	76.5	61.3	43.1	31.9	42.1	31.0	6677	76.2
2010	1087.8	202	94.4	70.3	62.5	40.2	61.5	39.3	8267	94.4
2011	1122.3	202	82.3	72.9	64.4	45.4	63.4	44.4	7145	81.6
2012	1243.3	202	95.0	76.8	71.1	49.9	70.1	49.0	8342	95.0
2013	1556.3	202	96.8	79.8	88.9	55.8	87.9	54.8	8477	96.8
2014	1398.9	202	88.8	81.0	80.0	58.9	79.1	58.0	7768	88.7

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2007 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		244			987	
D. Inspection, maintenance or repair without refuelling	75			175		
E. Testing of plant systems or components					60	
H. Nuclear regulatory requirements	672					
J. Grid limitation, failure or grid unavailability						6
L. Human factor related					32	

P. Fire					35	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)				238		380
Subtotal	747	244	0	413	1114	386
Total		991			1913	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2007 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		7
14. Safety Systems		5
16. Steam generation systems	197	
21. Fuel Handling and Storage Facilities		26
31. Turbine and auxiliaries		47
35. All other I&C Systems		6
41. Main Generator Systems	47	803
42. Electrical Power Supply Systems		76
Total	244	981

## IN-16 KAIGA-4

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP) at the beginning of 2014:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1465.8 GW(e)-h  
**Energy Availability Factor:** 83.2%  
**Load Factor:** 82.8%  
**Operating Factor:** 84.6%  
**Energy Unavailability Factor:** 16.8%  
**Total Off-line Time:** 1349 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)-h</b>	150.0	134.3	46.6	58.8	63.6	122.6	150.5	149.0	140.3	149.5	145.1	155.5	1465.8
<b>EAF (%)</b>	100.0	99.9	32.0	41.4	43.3	85.3	100.0	100.0	97.5	100.0	100.0	100.0	83.2
<b>UCF (%)</b>	100.0	100.0	33.9	47.3	49.4	87.6	100.0	100.0	100.0	100.0	100.0	100.0	84.7
<b>LF (%)</b>	99.8	98.9	31.0	40.4	42.3	84.3	100.1	99.1	96.5	99.5	99.8	103.5	82.8
<b>OF (%)</b>	100.0	100.0	33.2	46.8	49.1	87.5	100.0	100.0	100.0	100.0	100.0	100.0	84.6
<b>EUUF (%)</b>	0.0	0.1	68.0	58.6	56.7	14.7	0.0	0.0	2.5	0.0	0.0	0.0	16.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	20.7	12.4	0.0	0.0	0.0	0.0	0.0	0.0	2.8
<b>UCLF (%)</b>	0.0	0.0	66.1	52.7	29.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
<b>XUF (%)</b>	0.0	0.1	1.9	5.9	6.1	2.3	0.0	0.0	2.5	0.0	0.0	0.0	1.6

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 84.6% AND 83.6% RESPECTIVELY.

### 5. Historical Summary

**Date of Construction Start:** 10 May 2002 **Lifetime Generation:** 5000.3 GW(e)-h  
**Date of First Criticality:** 27 Nov 2010 **Cumulative Energy Availability Factor:** 72.2%  
**Date of Grid Connection:** 19 Jan 2011 **Cumulative Load Factor:** 71.5%  
**Date of Commercial Operation:** 20 Jan 2011 **Cumulative Unit Capability Factor:** 88.2%  
**Cumulative Energy Unavailability Factor:** 27.8%

Year	Energy [GW-h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2011	1166.3	202	93.6	93.6	70.5	70.5	69.3	69.3	7720	92.7
2012	1180.5	202	97.8	95.7	67.5	69.0	66.5	67.9	8585	97.7
2013	1187.6	202	76.8	89.3	67.7	68.6	67.1	67.6	6706	76.6
2014	1465.8	202	84.7	88.2	83.2	72.2	82.8	71.5	7411	84.6

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2011 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1104			360	
D. Inspection, maintenance or repair without refuelling	244			63		
E. Testing of plant systems or components				50		
H. Nuclear regulatory requirements				223		
J. Grid limitation, failure or grid unavailability						17
Subtotal	244	1104	0	336	360	17
Total		1348			713	

### 7. Equipment Related Full Outages, Analysis by System

System	2014	2011 to 2014
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System	Hours Lost	Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		0
16. Steam generation systems		81
21. Fuel Handling and Storage Facilities		29
31. Turbine and auxiliaries	489	55
32. Feedwater and Main Steam System		0
35. All other I&C Systems		16
41. Main Generator Systems	614	162
42. Electrical Power Supply Systems		2
Total	1103	357

## IN-9 KAKRAPAR-1

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 6500 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1719.7 GW(e)·h  
**Energy Availability Factor:** 97.6%  
**Load Factor:** 97.2%  
**Operating Factor:** 97.5%  
**Energy Unavailability Factor:** 2.4%  
**Total Off-line Time:** 217 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	152.7	137.8	123.1	142.7	145.9	141.2	144.0	132.7	146.3	150.9	147.1	155.2	1719.7
<b>EAF (%)</b>	100.0	100.0	83.5	100.0	100.0	100.0	98.1	90.2	100.0	100.0	100.0	100.0	97.6
<b>UCF (%)</b>	100.0	100.0	83.5	100.0	100.0	100.0	98.1	90.2	100.0	100.0	100.0	100.0	97.6
<b>LF (%)</b>	101.6	101.5	81.9	98.1	97.1	97.1	95.8	88.3	100.6	100.4	101.2	103.3	97.2
<b>OF (%)</b>	100.0	100.0	82.9	100.0	100.0	100.0	98.0	89.9	100.0	100.0	100.0	100.0	97.5
<b>EUf (%)</b>	0.0	0.0	16.5	0.0	0.0	0.0	1.9	9.8	0.0	0.0	0.0	0.0	2.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	16.5	0.0	0.0	0.0	1.9	9.8	0.0	0.0	0.0	0.0	2.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

DURING THE YEAR, UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 97.52% AND 99.17% RESPECTIVELY.

### 5. Historical Summary

**Date of Construction Start:** 01 Dec 1984      **Lifetime Generation:** 23586.1 GW(e)·h  
**Date of First Criticality:** 03 Sep 1992      **Cumulative Energy Availability Factor:** 66.4%  
**Date of Grid Connection:** 24 Nov 1992      **Cumulative Load Factor:** 63.5%  
**Date of Commercial Operation:** 06 May 1993      **Cumulative Unit Capability Factor:** 72.8%  
**Cumulative Energy Unavailability Factor:** 33.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1993			Data not provided							
1994	130.3	194	13.2	13.2	12.0	12.0	7.7	7.7	1049	12.0
1995	1089.1	195	70.5	41.9	66.5	39.3	63.8	35.8	6225	71.1
1996	1295.8	195	84.6	56.2	75.7	51.5	75.7	49.1	7539	85.8
1997	906.7	195	58.4	56.8	52.9	51.8	53.1	50.1	5140	58.7
1998	1090.6	195	67.0	58.8	63.1	54.1	63.8	52.9	5987	68.3
1999	1407.1	195	87.7	63.6	85.1	59.2	82.4	57.8	7450	85.0
2000	1645.4	195	95.2	68.2	94.5	64.3	96.1	63.3	8445	96.1
2001	1517.5	195	86.5	70.4	86.5	67.1	88.8	66.5	7690	87.8
2002	1697.8	202	96.8	73.5	96.7	70.5	95.9	69.8	8488	96.9
2003	1419.4	202	87.5	74.9	81.9	71.6	80.2	70.9	7622	87.0
2004	1064.4	202	89.1	76.2	89.1	73.3	60.0	69.9	7416	84.4
2005	1089.4	202	94.2	77.8	63.1	72.4	61.6	69.2	7969	91.0
2006	985.6	202	83.9	78.2	59.8	71.4	55.7	68.1	7316	83.5
2007	828.7	202	80.5	78.4	53.3	70.1	46.8	66.6	6867	78.4
2008	438.1	202	49.7	76.4	30.0	67.4	24.7	63.7	4210	47.9
2009	0.0	202	0.0	71.6	0.0	63.1	0.0	59.7	0	0.0
2010	0.0	202	3.5	67.5	3.5	59.5	0.0	56.1	0	0.0
2011	1621.4	202	93.1	69.0	93.1	61.4	91.6	58.1	8177	93.3
2012	1640.7	202	93.4	70.3	93.4	63.1	92.5	59.9	8186	93.2
2013	1711.8	202	95.9	71.6	95.9	64.8	96.7	61.8	8387	95.7
2014	1719.7	202	97.6	72.8	97.6	66.4	97.2	63.5	8543	97.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1994 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					476	
D. Inspection, maintenance or repair without refuelling				633		
E. Testing of plant systems or components				56	49	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1057		
H. Nuclear regulatory requirements					53	
J. Grid limitation, failure or grid unavailability						48
L. Human factor related					4	
P. Fire					6	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						15
Z. Other					2	7
Subtotal	0	0	0	1746	590	70
Total	0			2406		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1994 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		33
12. Reactor I&C Systems		33
13. Reactor Auxiliary Systems		11
15. Reactor Cooling Systems		115
16. Steam generation systems		33
17. Safety I&C Systems (excluding reactor I&C)		11
21. Fuel Handling and Storage Facilities		19
31. Turbine and auxiliaries		80
32. Feedwater and Main Steam System		11
35. All other I&C Systems		13
41. Main Generator Systems		68
42. Electrical Power Supply Systems		44
Total	0	471

## IN-10 KAKRAPAR-2

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 6500 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1439.3 GW(e)·h  
**Energy Availability Factor:** 83.6%  
**Load Factor:** 81.3%  
**Operating Factor:** 88.4%  
**Energy Unavailability Factor:** 16.4%  
**Total Off-line Time:** 1012 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	146.8	132.9	146.6	27.1	70.3	117.5	133.6	123.5	130.6	136.0	132.8	141.7	1439.3
<b>EAF (%)</b>	95.0	94.5	95.0	23.1	56.7	86.7	93.4	86.5	93.2	93.4	92.9	93.4	83.6
<b>UCF (%)</b>	95.0	94.5	95.0	23.1	56.7	86.7	93.4	86.5	93.2	93.4	92.9	93.4	83.6
<b>LF (%)</b>	97.7	97.9	97.5	18.7	46.7	80.8	88.9	82.2	89.8	90.5	91.3	94.3	81.3
<b>OF (%)</b>	100.0	100.0	100.0	20.3	55.1	93.3	100.0	92.9	100.0	100.0	99.6	100.0	88.4
<b>EUf (%)</b>	5.0	5.5	5.0	76.9	43.3	13.3	6.6	13.5	6.8	6.6	7.1	6.6	16.4
<b>PUf (%)</b>	5.0	5.5	5.0	76.9	33.6	6.8	6.6	6.6	6.8	6.6	6.8	6.6	14.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	9.7	6.5	0.0	6.9	0.0	0.0	0.3	0.0	2.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

DURING THE YEAR UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 88.45% AND 83.17% RESPECTIVELY. UNIT OPERATED AT A REDUCED POWER LEVEL BETWEEN 91% TO 96% DUE TO WET QUARANTINING OF COOLANT CHANNELS.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1985 **Lifetime Generation:** 25292.8 GW(e)·h  
**Date of First Criticality:** 08 Jan 1995 **Cumulative Energy Availability Factor:** 77.5%  
**Date of Grid Connection:** 04 Mar 1995 **Cumulative Load Factor:** 74.1%  
**Date of Commercial Operation:** 01 Sep 1995 **Cumulative Unit Capability Factor:** 89.1%  
**Cumulative Energy Unavailability Factor:** 22.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1995	452.7	196	92.0	92.0	88.2	88.2	79.3	79.3	2513	85.8
1996	1326.8	195	86.3	87.7	77.5	80.2	77.5	77.9	7663	87.2
1997	1093.4	195	66.7	78.7	63.8	73.2	64.0	72.0	6139	70.1
1998	1291.6	195	78.7	78.7	76.6	74.2	75.6	73.1	6932	79.1
1999	1512.3	195	92.4	81.8	91.1	78.1	88.5	76.6	7955	90.8
2000	1489.9	195	85.8	82.6	85.6	79.5	87.0	78.6	7697	87.6
2001	1685.4	195	96.0	84.7	95.3	82.0	98.7	81.7	8500	97.0
2002	1597.1	202	89.5	85.4	89.2	83.0	90.3	82.9	7940	90.6
2003	1613.2	202	97.3	86.8	92.3	84.1	91.2	84.0	8515	97.2
2004	1142.0	202	90.9	87.3	90.9	84.9	64.4	81.8	7658	87.2
2005	1255.0	202	92.9	87.8	72.3	83.6	70.9	80.7	7979	91.1
2006	865.8	202	74.6	86.7	53.1	80.9	48.9	77.9	6473	73.9
2007	1011.7	202	97.0	87.5	63.1	79.4	57.2	76.2	8447	96.4
2008	938.1	202	97.8	88.3	60.1	78.0	52.9	74.4	8596	97.9
2009	780.4	202	92.5	88.6	47.6	75.8	44.1	72.2	7506	85.7
2010	751.1	202	86.5	88.5	45.9	73.8	42.4	70.3	7530	86.0
2011	1642.0	202	97.8	89.0	96.0	75.2	92.8	71.7	8568	97.8
2012	1517.7	202	86.4	88.9	86.4	75.9	85.5	72.5	7639	87.0
2013	1689.4	202	98.6	89.4	98.6	77.1	95.5	73.7	8682	99.1
2014	1439.3	202	83.6	89.1	83.6	77.5	81.3	74.1	7748	88.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1995 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					380	
D. Inspection, maintenance or repair without refuelling				424	37	
E. Testing of plant systems or components				7	17	
H. Nuclear regulatory requirements					44	
J. Grid limitation, failure or grid unavailability						25
L. Human factor related					7	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						3
Z. Other					3	
Subtotal	0	0	0	431	488	28
Total	0			947		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1995 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		24
13. Reactor Auxiliary Systems		7
14. Safety Systems		8
15. Reactor Cooling Systems		20
16. Steam generation systems		10
17. Safety I&C Systems (excluding reactor I&C)		27
21. Fuel Handling and Storage Facilities		11
31. Turbine and auxiliaries		85
32. Feedwater and Main Steam System		65
35. All other I&C Systems		2
41. Main Generator Systems		54
42. Electrical Power Supply Systems		55
Total	0	376



# IN-25 KUDANKULAM-1

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** MAEP (MINATOMENERGOPROM, MINISTRY OF NUCLEAR POWER AND INDUSTRY)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 917.0 MW(e)  
**Design Net Capacity:** 917.0 MW(e)  
**Design Discharge Burnup:** 42000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 488.1 GW(e)·h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 71.5%  
**Operating Factor:** 77.7%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 166 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h												488.1	488.1
EAF (%)												100.0	100.0
UCF (%)												100.0	100.0
LF (%)												71.5	71.5
OF (%)												77.7	77.7
EUf (%)												0.0	0.0
PUf (%)												0.0	0.0
UCLF (%)												0.0	0.0
XUF (%)												0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

UNIT WAS DECLARED COMMERCIAL AT 00:00 HOURS ON 31 DECEMBER 2014. IN YEAR 2014, IT PRODUCED INFIRM POWER OF 2520.040 GWH AND COMMERCIAL POWER OF 22.191 GWH.

## 5. Historical Summary

**Date of Construction Start:** 31 Mar 2002 **Lifetime Generation:** 2542.2 GW(e)·h  
**Date of First Criticality:** 13 Jul 2013 **Cumulative Energy Availability Factor:** 100.0%  
**Date of Grid Connection:** 22 Oct 2013 **Cumulative Load Factor:** 71.5%  
**Date of Commercial Operation:** 31 Dec 2014 **Cumulative Unit Capability Factor:** 100.0%  
**Cumulative Energy Unavailability Factor:** 0.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2014	488.1	917	100.0	100.0	100.0	100.0	71.5	71.5	578	77.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2014 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External

The reactor has not yet completed a full year of commercial operation.

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2014 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

## IN-5 MADRAS-1

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 205.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 6700 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1122.3 GW(e)·h  
**Energy Availability Factor:** 63.4%  
**Load Factor:** 62.5%  
**Operating Factor:** 85.3%  
**Energy Unavailability Factor:** 36.6%  
**Total Off-line Time:** 1286 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	111.9	78.6	109.6	106.9	84.4	110.0	116.9	115.9	109.7	107.5	70.7	0.0	1122.3
<b>EAF (%)</b>	73.4	57.0	71.8	72.4	66.1	74.5	76.7	76.0	74.3	70.5	47.9	0.0	63.4
<b>UCF (%)</b>	100.0	81.5	100.0	100.0	90.7	100.0	100.0	100.0	100.0	100.0	62.8	0.0	86.2
<b>LF (%)</b>	73.4	57.0	71.8	72.4	55.4	74.5	76.7	76.0	74.3	70.5	47.9	0.0	62.5
<b>OF (%)</b>	100.0	81.5	100.0	100.0	79.8	100.0	100.0	100.0	100.0	100.0	62.8	0.0	85.3
<b>EUf (%)</b>	26.6	43.0	28.2	27.6	33.9	25.5	23.3	24.0	25.7	29.5	52.1	100.0	36.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.2	100.0	11.6
<b>UCLF (%)</b>	0.0	18.5	0.0	0.0	9.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2
<b>XUF (%)</b>	26.6	24.5	28.2	27.6	24.5	25.5	23.3	24.0	25.7	29.5	14.8	0.0	22.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 96.46% AND 73.55% RESPECTIVELY. UNIT CONTINUED TO OPERATE AT A REDUCED POWER LEVEL OF ABOUT 80% FULL POWER DUE TO MISMATCH IN FUEL DEMAND AND SUPPLY.

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1971 **Lifetime Generation:** 27029.2 GW(e)·h  
**Date of First Criticality:** 02 Jul 1983 **Cumulative Energy Availability Factor:** 55.1%  
**Date of Grid Connection:** 23 Jul 1983 **Cumulative Load Factor:** 51.3%  
**Date of Commercial Operation:** 27 Jan 1984 **Cumulative Unit Capability Factor:** 65.4%  
**Cumulative Energy Unavailability Factor:** 44.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	1115.8	210	61.0	61.0	60.5	60.5	60.5	60.5	6333	72.1
1985	822.1	215	50.1	55.5	49.5	54.9	43.6	52.0	4827	55.1
1986	757.1	220	40.7	50.5	39.3	49.6	39.3	47.7	4629	52.8
1987	1100.0	220	61.0	53.2	57.1	51.5	57.1	50.1	6047	69.0
1988	1258.0	220	65.7	55.7	65.1	54.3	65.1	53.1	6691	76.2
1989	404.6	220	21.0	49.8	21.0	48.7	21.0	47.7	4350	49.7
1990	863.7	215	47.8	49.6	45.6	48.2	45.9	47.4	7320	83.6
1991	499.9	215	44.8	49.0	44.4	47.7	26.5	44.9	3546	40.5
1992	1082.6	194	87.3	52.8	84.6	51.5	63.5	46.7	7412	84.4
1993	538.9	194	46.3	52.2	43.9	50.8	31.7	45.4	3836	43.8
1994	809.0	194	72.5	53.9	66.6	52.1	47.6	45.5	5974	68.2
1995	1085.2	194	98.4	57.4	86.8	54.8	63.9	47.0	7584	86.6
1996	617.1	161	50.6	57.0	50.6	54.5	43.7	46.8	4348	49.5
1997	893.0	150	74.3	57.9	68.0	55.2	68.0	47.9	6451	73.6
1998	703.4	150	56.1	57.8	55.5	55.2	53.5	48.2	4858	55.5
1999	1182.4	150	92.5	59.5	92.5	57.0	90.0	50.2	8095	92.4
2000	667.8	150	50.9	59.1	50.9	56.8	50.7	50.2	4468	50.9
2001	1174.5	150	90.1	60.4	88.5	58.1	89.4	51.9	7751	88.5
2002	895.8	155	69.7	60.8	67.7	58.6	66.0	52.5	5885	67.2
2003	810.6	155	65.3	61.0	65.3	58.8	59.7	52.8	5421	61.9
2004	0.0	155	0.0	58.6	0.0	56.5	0.0	50.7	0	0.0

2005	0.0	155	0.0	56.3	0.0	54.3	0.0	48.8	0	0.0
2006	1225.0	185	89.3	57.9	68.6	55.0	70.2	49.8	7823	89.3
2007	695.8	205	66.4	58.3	39.3	54.3	38.7	49.3	5814	66.4
2008	697.9	205	77.3	59.1	38.8	53.6	38.8	48.8	6791	77.3
2009	721.6	205	73.1	59.7	40.2	53.0	40.2	48.4	6404	73.1
2010	1024.4	205	98.3	61.3	57.0	53.2	57.0	48.8	8614	98.3
2011	1117.4	205	88.2	62.3	62.2	53.5	62.2	49.3	7655	87.4
2012	1316.3	205	96.3	63.6	73.1	54.3	73.1	50.2	8459	96.3
2013	1259.8	205	94.0	64.7	70.2	54.8	70.2	50.9	8231	94.0
2014	1122.3	205	86.2	65.4	63.4	55.1	62.5	51.3	7474	85.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		193			805	
D. Inspection, maintenance or repair without refuelling	1012			1167		
E. Testing of plant systems or components				9	50	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				296		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				283		
J. Grid limitation, failure or grid unavailability			80			94
L. Human factor related					11	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						8
P. Fire					7	
Z. Other					2	
Subtotal	1012	193	80	1755	875	102
Total		1285			2732	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		123
12. Reactor I&C Systems	124	60
13. Reactor Auxiliary Systems		20
15. Reactor Cooling Systems		61
16. Steam generation systems		23
17. Safety I&C Systems (excluding reactor I&C)		26
21. Fuel Handling and Storage Facilities		30
31. Turbine and auxiliaries		82
32. Feedwater and Main Steam System		49
35. All other I&C Systems		1
41. Main Generator Systems		24
42. Electrical Power Supply Systems		284
XX. Miscellaneous Systems	69	16
Total	193	799

## IN-6 MADRAS-2

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 205.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 6700 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1183.6 GW(e)·h  
**Energy Availability Factor:** 65.9%  
**Load Factor:** 65.9%  
**Operating Factor:** 88.5%  
**Energy Unavailability Factor:** 34.1%  
**Total Off-line Time:** 1005 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	114.1	107.9	117.5	112.5	113.2	109.2	113.4	113.1	106.2	25.8	86.3	64.3	1183.6
<b>EAF (%)</b>	74.8	78.3	77.1	76.2	74.2	74.0	74.4	74.2	72.0	16.9	58.5	42.2	65.9
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	28.6	76.3	60.8	88.7
<b>LF (%)</b>	74.8	78.3	77.1	76.2	74.2	74.0	74.4	74.2	72.0	16.9	58.5	42.2	65.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0	100.0	27.3	76.3	60.8	88.5
<b>EUUF (%)</b>	25.2	21.7	22.9	23.8	25.8	26.0	25.6	25.8	28.0	83.1	41.5	57.8	34.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71.4	23.7	39.2	11.3
<b>XUF (%)</b>	25.2	21.7	22.9	23.8	25.8	26.0	25.6	25.8	28.0	11.7	17.8	18.6	22.7

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 88.53% AND 67.92% RESPECTIVELY. UNIT HAD A CONTINUOUS OPERATION OF 370 DAYS.

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1972 **Lifetime Generation:** 26489.0 GW(e)·h  
**Date of First Criticality:** 12 Aug 1985 **Cumulative Energy Availability Factor:** 58.0%  
**Date of Grid Connection:** 20 Sep 1985 **Cumulative Load Factor:** 55.1%  
**Date of Commercial Operation:** 21 Mar 1986 **Cumulative Unit Capability Factor:** 70.4%  
**Cumulative Energy Unavailability Factor:** 42.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	649.9	220	40.2	40.2	40.2	40.2	40.2	40.2	4409	60.0
1987	1066.0	220	62.5	52.3	55.5	48.5	55.3	48.4	6382	72.9
1988	642.0	220	33.2	45.6	33.2	43.1	33.2	43.1	3535	40.2
1989	438.2	220	22.7	39.6	22.7	37.8	22.7	37.8	4350	49.7
1990	1082.4	215	61.6	44.1	57.2	41.7	57.5	41.8	7726	88.2
1991	1083.0	215	87.2	51.4	86.6	49.3	57.5	44.4	7642	87.2
1992	665.2	194	55.2	51.9	54.2	50.0	39.0	43.7	4751	54.1
1993	950.3	205	80.2	55.3	77.1	53.3	52.9	44.8	6625	75.6
1994	1032.1	194	85.5	58.5	80.9	56.1	60.7	46.5	7071	80.7
1995	274.7	194	22.7	55.1	21.4	52.9	16.2	43.6	1871	21.4
1996	1061.9	161	84.7	57.3	82.2	55.0	75.1	45.9	7256	82.6
1997	958.2	150	75.6	58.4	72.4	56.1	72.9	47.6	6464	73.8
1998	1104.2	150	87.0	60.1	85.4	57.8	84.0	49.8	7478	85.4
1999	879.9	150	68.0	60.6	65.7	58.3	67.0	50.8	5755	65.7
2000	1273.4	150	95.7	62.4	94.6	60.2	96.6	53.2	8304	94.5
2001	1119.1	150	88.5	63.7	87.6	61.6	85.2	54.8	7671	87.6
2002	22.7	155	1.7	60.7	1.7	58.6	1.7	52.2	183	2.1
2003	589.1	155	40.0	59.7	40.0	57.7	43.4	51.8	3135	35.8
2004	1274.3	155	92.4	61.2	90.9	59.2	93.6	53.7	7970	90.7
2005	1475.8	155	92.5	62.5	91.3	60.6	108.7	56.0	8165	93.2
2006	1086.6	202	90.0	64.0	59.9	60.6	61.4	56.3	7894	90.1
2007	971.1	202	97.4	65.7	54.1	60.3	54.9	56.2	8537	97.5

2008	715.7	202	80.4	66.4	39.0	59.2	40.3	55.5	7080	80.6
2009	931.5	205	93.4	67.6	51.9	58.9	51.9	55.3	8178	93.4
2010	806.1	205	86.7	68.5	44.9	58.3	44.9	54.8	7596	86.7
2011	1155.8	205	98.2	69.7	64.4	58.5	64.4	55.2	8600	98.2
2012	1181.6	205	95.0	70.8	65.6	58.8	65.6	55.7	8339	94.9
2013	561.7	205	42.6	69.7	31.3	57.7	31.3	54.7	3735	42.6
2014	1183.6	205	88.7	70.4	65.9	58.0	65.9	55.1	7755	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		993			891	
D. Inspection, maintenance or repair without refuelling				719		
E. Testing of plant systems or components				49	7	
J. Grid limitation, failure or grid unavailability						82
L. Human factor related					7	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						8
P. Fire					4	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				464		
Z. Other					1	
Subtotal	0	993	0	1232	910	90
Total		993			2232	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		206
12. Reactor I&C Systems		46
13. Reactor Auxiliary Systems		12
14. Safety Systems		4
15. Reactor Cooling Systems		127
16. Steam generation systems	993	31
17. Safety I&C Systems (excluding reactor I&C)		12
21. Fuel Handling and Storage Facilities		76
31. Turbine and auxiliaries		111
32. Feedwater and Main Steam System		23
35. All other I&C Systems		2
41. Main Generator Systems		42
42. Electrical Power Supply Systems		183
XX. Miscellaneous Systems		11
Total	993	886

## IN-7 NARORA-1

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 15000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1067.6 GW(e)·h  
**Energy Availability Factor:** 62.3%  
**Load Factor:** 60.3%  
**Operating Factor:** 88.5%  
**Energy Unavailability Factor:** 37.7%  
**Total Off-line Time:** 1010 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	124.7	101.5	76.5	108.1	2.0	78.5	93.9	93.0	91.5	96.0	96.7	105.1	1067.6
<b>EAF (%)</b>	85.0	76.8	52.9	76.3	3.3	56.0	64.5	63.9	64.9	65.9	68.4	71.9	62.3
<b>UCF (%)</b>	100.0	100.0	72.7	100.0	5.4	88.6	100.0	99.9	100.0	100.0	100.0	100.0	88.7
<b>LF (%)</b>	83.0	74.8	50.9	74.3	1.3	54.0	62.5	61.9	62.9	63.9	66.5	69.9	60.3
<b>OF (%)</b>	100.0	100.0	72.0	100.0	3.5	88.3	100.0	100.0	100.0	100.0	100.0	100.0	88.5
<b>EUf (%)</b>	15.0	23.2	47.1	23.7	96.7	44.0	35.5	36.1	35.1	34.1	31.6	28.1	37.7
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	94.7	11.2	0.0	0.0	0.0	0.0	0.0	0.0	9.0
<b>UCLF (%)</b>	0.0	0.0	27.4	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	2.3
<b>XUF (%)</b>	15.0	23.2	19.8	23.7	2.0	32.6	35.5	36.1	35.1	34.1	31.6	28.1	26.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 88.47% AND 64.29% RESPECTIVELY. DURING THE YEAR UNIT OPERATED AT A REDUCED POWER LEVEL OF ABOUT 80% FULL POWER DUE TO MISMATCH IN FUEL DEMAND AND SUPPLY.

### 5. Historical Summary

**Date of Construction Start:** 01 Dec 1976 **Lifetime Generation:** 22710.2 GW(e)·h  
**Date of First Criticality:** 12 Mar 1989 **Cumulative Energy Availability Factor:** 55.6%  
**Date of Grid Connection:** 29 Jul 1989 **Cumulative Load Factor:** 53.0%  
**Date of Commercial Operation:** 01 Jan 1991 **Cumulative Unit Capability Factor:** 68.5%  
**Cumulative Energy Unavailability Factor:** 44.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1991	449.3	210	42.8	42.8	42.3	42.3	24.4	24.4	4331	49.4
1992	742.7	200	42.8	42.8	42.3	42.3	42.3	33.1	5514	62.8
1993	339.6	200	19.4	35.1	19.4	34.8	19.4	28.6	2032	23.2
1994	0.0	200	0.0	26.5	0.0	26.2	0.0	21.6	0	0.0
1995	944.4	200	68.3	34.7	66.0	34.1	53.9	28.0	5740	65.5
1996	1162.3	200	76.9	41.7	66.2	39.4	66.2	34.3	6407	72.9
1997	1585.2	200	92.8	49.0	89.3	46.5	90.5	42.3	8128	92.8
1998	1485.6	200	90.8	54.2	83.9	51.1	84.8	47.5	7986	91.2
1999	1128.6	200	76.8	56.7	76.5	53.9	64.4	49.4	6703	76.5
2000	1386.3	200	87.2	59.7	83.4	56.8	78.9	52.3	7452	84.8
2001	1563.0	200	91.9	62.6	89.2	59.8	89.2	55.7	8157	93.1
2002	1574.5	202	89.3	64.9	88.0	62.1	89.0	58.5	7912	90.3
2003	1528.2	202	95.1	67.2	86.0	64.0	86.4	60.6	8254	94.2
2004	1120.6	202	82.5	68.3	64.8	64.0	63.2	60.8	6860	78.1
2005	1064.8	202	80.5	69.1	62.4	63.9	60.2	60.8	6924	79.0
2006	0.0	202	0.0	64.8	0.0	59.9	0.0	57.0	0	0.0
2007	0.0	202	0.0	61.0	0.0	56.4	0.0	53.6	0	0.0
2008	567.2	202	76.8	61.8	33.6	55.1	32.0	52.4	5963	67.9
2009	551.1	202	72.5	62.4	33.1	54.0	31.1	51.3	6298	71.9
2010	956.9	202	93.6	64.0	56.1	54.1	54.1	51.4	8191	93.5
2011	1044.6	202	97.0	65.6	61.0	54.4	59.0	51.8	8494	97.0

2012	987.2	202	86.9	66.5	57.6	54.5	55.6	51.9	7611	86.6
2013	1223.6	202	90.8	67.6	73.4	55.4	69.1	52.7	7739	88.3
2014	1067.6	202	88.7	68.5	62.3	55.6	60.3	53.0	7750	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1991 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		211			837	
C. Inspection, maintenance or repair combined with refuelling				82		
D. Inspection, maintenance or repair without refuelling	800			631		
E. Testing of plant systems or components				19	18	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				116		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				730		
H. Nuclear regulatory requirements				80	8	
J. Grid limitation, failure or grid unavailability						64
L. Human factor related					6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						10
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						25
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				35	14	
Z. Other					3	2
Subtotal	800	211	0	1693	886	101
Total		1011			2680	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1991 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		22
12. Reactor I&C Systems		51
13. Reactor Auxiliary Systems		20
15. Reactor Cooling Systems	2	126
16. Steam generation systems		11
17. Safety I&C Systems (excluding reactor I&C)		24
21. Fuel Handling and Storage Facilities	61	35
31. Turbine and auxiliaries	148	371
32. Feedwater and Main Steam System		16
33. Circulating Water System		1
41. Main Generator Systems		92
42. Electrical Power Supply Systems		59
XX. Miscellaneous Systems		2
Total	211	830

## IN-8 NARORA-2

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 15000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1245.7 GW(e)·h  
**Energy Availability Factor:** 72.4%  
**Load Factor:** 70.4%  
**Operating Factor:** 98.7%  
**Energy Unavailability Factor:** 27.6%  
**Total Off-line Time:** 114 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	106.7	95.2	103.0	81.5	106.6	101.3	104.3	104.4	102.8	110.0	110.0	119.8	1245.7
<b>EAF (%)</b>	73.0	72.1	70.5	58.0	72.9	71.6	71.4	71.5	72.7	75.2	77.6	81.7	72.4
<b>UCF (%)</b>	100.0	100.0	100.0	84.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.7
<b>LF (%)</b>	71.0	70.1	68.6	56.0	70.9	69.7	69.4	69.5	70.7	73.2	75.6	79.7	70.4
<b>OF (%)</b>	100.0	100.0	100.0	84.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.7
<b>EUUF (%)</b>	27.0	27.9	29.5	42.0	27.1	28.4	28.6	28.5	27.3	24.8	22.4	18.3	27.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	15.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
<b>XUF (%)</b>	27.0	27.9	29.5	26.5	27.1	28.4	28.6	28.5	27.3	24.8	22.4	18.3	26.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 98.7% AND 73.94% RESPECTIVELY. DURING THE YEAR UNIT OPERATED AT A REDUCED POWER LEVEL OF ABOUT 80% FULL POWER.

### 5. Historical Summary

**Date of Construction Start:** 01 Nov 1977 **Lifetime Generation:** 22473.9 GW(e)·h  
**Date of First Criticality:** 24 Oct 1991 **Cumulative Energy Availability Factor:** 57.9%  
**Date of Grid Connection:** 05 Jan 1992 **Cumulative Load Factor:** 56.6%  
**Date of Commercial Operation:** 01 Jul 1992 **Cumulative Unit Capability Factor:** 70.1%  
**Cumulative Energy Unavailability Factor:** 42.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1992	567.0	201	65.2	65.2	64.2	64.2	64.2	64.2	3553	80.5
1993	83.3	200	4.8	25.1	4.8	24.7	4.8	24.7	548	6.3
1994	761.7	200	53.1	36.3	43.5	32.2	43.5	32.2	5494	62.7
1995	1036.8	200	68.6	45.5	66.1	41.9	59.2	39.9	5798	66.2
1996	1227.5	200	79.4	53.0	69.9	48.1	69.9	46.6	6572	74.8
1997	1568.7	200	91.4	60.0	89.2	55.6	89.5	54.4	8121	92.7
1998	1333.2	200	80.1	63.1	75.1	58.6	76.1	57.7	6829	78.0
1999	1425.9	200	87.0	66.3	85.8	62.2	81.4	60.9	7468	85.3
2000	1340.8	200	80.6	68.0	79.9	64.3	76.3	62.7	7182	81.8
2001	1343.0	200	75.4	68.7	74.5	65.4	76.7	64.2	6897	78.7
2002	1692.8	202	95.7	71.3	94.8	68.2	95.7	67.2	8416	96.1
2003	1287.1	202	85.4	72.6	70.7	68.4	72.7	67.7	7458	85.1
2004	1364.6	202	96.7	74.5	78.9	69.2	76.9	68.4	8447	96.2
2005	1222.9	202	93.2	75.9	71.5	69.4	69.1	68.5	7907	90.3
2006	1229.4	202	94.6	77.2	71.9	69.6	69.5	68.5	8278	94.5
2007	496.8	202	54.9	75.8	30.0	67.0	28.1	65.9	4808	54.9
2008	0.0	202	0.0	71.1	0.0	62.9	0.0	61.9	0	0.0
2009	0.0	202	0.0	67.1	0.0	59.3	0.0	58.3	0	0.0
2010	289.2	202	27.8	64.9	18.3	57.1	16.3	56.1	2282	26.1
2011	766.0	202	91.7	66.3	45.3	56.5	43.3	55.4	8014	91.5
2012	1120.1	202	96.8	67.8	65.1	56.9	63.1	55.8	8495	96.7
2013	1065.0	202	89.5	68.8	63.6	57.2	60.2	56.0	7697	87.9



2014	1245.7	202	98.7	70.1	72.4	57.9	70.4	56.6	8646	98.7
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## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1992 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		114			423	
C. Inspection, maintenance or repair combined with refuelling				55		
D. Inspection, maintenance or repair without refuelling				775		
E. Testing of plant systems or components				19	17	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1036		
H. Nuclear regulatory requirements					19	
J. Grid limitation, failure or grid unavailability						77
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						4
L. Human factor related					7	
P. Fire					19	
Z. Other					22	
Subtotal	0	114	0	1885	507	81
Total		114			2473	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1992 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		35
12. Reactor I&C Systems		37
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems		43
16. Steam generation systems		2
17. Safety I&C Systems (excluding reactor I&C)		10
21. Fuel Handling and Storage Facilities		25
31. Turbine and auxiliaries		138
32. Feedwater and Main Steam System		20
41. Main Generator Systems		23
42. Electrical Power Supply Systems	114	81
Total	114	418

## IN-3 RAJASTHAN-1

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** AECL (ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 90.0 MW(e)  
**Design Net Capacity:** 207.0 MW(e)  
**Design Discharge Burnup:** 6700 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT CONTINUED TO REMAIN SHUTDOWN THOROUGHOUT THE YEAR.

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1965 **Lifetime Generation:** 10138.4 GW(e)·h  
**Date of First Criticality:** 11 Aug 1972 **Cumulative Energy Availability Factor:** 22.1%  
**Date of Grid Connection:** 30 Nov 1972 **Cumulative Load Factor:** 19.0%  
**Date of Commercial Operation:** 16 Dec 1973 **Cumulative Unit Capability Factor:** 23.0%  
**Cumulative Energy Unavailability Factor:** 77.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	55.0	145	90.6	90.6	90.6	90.6	51.0	51.0	553	74.3
1974	667.6	207	36.8	39.8	36.8	39.8	36.8	37.6	4690	53.5
1975	599.7	206	33.2	36.6	33.2	36.6	33.2	35.5	3817	43.6
1976	801.9	206	44.3	39.1	44.3	39.1	44.3	38.4	5728	65.2
1977	456.9	206	26.4	36.0	26.4	36.0	25.3	35.2	3312	37.8
1978	153.2	206	8.5	30.6	8.5	30.6	8.5	29.9	1537	17.5
1979	1147.3	206	63.6	36.0	63.6	36.0	63.6	35.5	7217	82.4
1980	953.1	206	52.7	38.4	52.7	38.4	52.7	37.9	6346	72.2
1981	441.5	220	22.9	36.4	22.9	36.4	22.9	35.9	3732	42.6
1982	38.2	206	2.1	32.6	2.1	32.6	2.1	32.2	496	5.7
1983	0.0	202	0.0	29.4	0.0	29.4	0.0	29.1	0	0.0
1984	0.0	180	0.0	27.1	0.0	27.1	0.0	26.8	0	0.0
1985	226.2	204	12.7	25.9	12.7	25.9	12.7	25.6	1914	21.8
1986	0.0	207	0.0	23.9	0.0	23.9	0.0	23.6	0	0.0
1987	169.9	207	16.6	23.4	9.4	22.9	9.4	22.6	2555	29.2
1988	376.5	207	25.3	23.5	20.7	22.7	20.7	22.5	5793	65.9
1989	312.8	207	18.7	23.2	17.3	22.4	17.3	22.2	4779	54.6
1990	364.1	192	22.3	23.2	19.4	22.2	21.6	22.1	5789	66.1
1991	197.5	192	74.8	25.9	74.8	25.0	11.7	21.6	2858	32.6
1992	57.7	84	12.2	25.5	12.2	24.7	7.8	21.3	1070	12.2
1993	167.6	84	22.8	25.5	22.8	24.6	22.8	21.3	2435	27.8
1994	2.9	84	2.2	25.0	2.2	24.1	0.4	20.9	195	2.2
1995	0.0	84	0.0	24.5	0.0	23.6	0.0	20.4	0	0.0

1996	0.0	84	0.0	24.0	0.0	23.2	0.0	20.0	0	0.0
1997	264.6	84	39.2	24.3	31.9	23.3	36.0	20.3	2792	31.9
1998	567.4	134	63.8	25.5	62.2	24.5	48.3	21.2	5448	62.2
1999	795.0	134	81.0	27.2	73.6	26.0	67.7	22.6	6443	73.6
2000	681.3	134	57.5	28.1	57.0	26.9	57.9	23.6	5008	57.0
2001	173.2	134	10.5	27.6	10.0	26.4	14.8	23.4	860	9.8
2002	0.0	90	0.0	27.0	0.0	25.9	0.0	22.9	0	0.0
2003	0.0	134	0.0	26.3	0.0	25.2	0.0	22.3	0	0.0
2004	303.8	134	56.8	27.1	56.8	26.1	25.8	22.4	3785	43.1
2005	0.0	90	0.0	26.6	0.0	25.6	0.0	22.0	0	0.0
2006	0.0	90	0.0	26.2	0.0	25.2	0.0	21.6	0	0.0
2007	0.0	90	0.0	25.7	0.0	24.8	0.0	21.3	0	0.0
2008	0.0	90	0.0	25.3	0.0	24.3	0.0	20.9	0	0.0
2009	0.0	90	0.0	24.9	0.0	24.0	0.0	20.6	0	0.0
2010	0.0	90	0.0	24.5	0.0	23.6	0.0	20.3	0	0.0
2011	0.0	90	0.0	24.1	0.0	23.2	0.0	19.9	0	0.0
2012	0.0	90	0.0	23.7	0.0	22.8	0.0	19.6	0	0.0
2013	0.0	90	0.0	23.4	0.0	22.5	0.0	19.3	0	0.0
2014	0.0	90	0.0	23.0	0.0	22.1	0.0	19.0	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1973 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					1928	
D. Inspection, maintenance or repair without refuelling				2236		
E. Testing of plant systems or components					5	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				1113		
J. Grid limitation, failure or grid unavailability						94
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						2
L. Human factor related					29	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						38
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				7	16	
Z. Other	8760			839		
Subtotal	8760	0	0	4195	1978	134
Total	8760			6307		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1973 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		836
12. Reactor I&C Systems		133
13. Reactor Auxiliary Systems		43
14. Safety Systems		25
15. Reactor Cooling Systems		330
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		12
31. Turbine and auxiliaries		362
32. Feedwater and Main Steam System		8
41. Main Generator Systems		77
42. Electrical Power Supply Systems		84
XX. Miscellaneous Systems		5

Total	0	1920
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## IN-4 RAJASTHAN-2

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** AECL/DAE (ATOMIC ENERGY OF CANADA Ltda AND DEPARTMENT OF ATOMIC ENERGY(INDIA))

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 187.0 MW(e)  
**Design Net Capacity:** 207.0 MW(e)  
**Design Discharge Burnup:** 6700 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1129.4 GW(e)·h  
**Energy Availability Factor:** 70.9%  
**Load Factor:** 68.9%  
**Operating Factor:** 74.6%  
**Energy Unavailability Factor:** 29.1%  
**Total Off-line Time:** 2226 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	127.7	116.6	127.7	102.9	127.7	103.8	-2.0	27.6	16.7	136.0	131.0	113.8	1129.4
<b>EAF (%)</b>	95.6	96.4	95.5	79.2	95.1	78.2	0.0	19.8	12.4	97.7	98.2	84.8	70.9
<b>UCF (%)</b>	100.0	100.0	100.0	83.7	100.0	83.3	0.0	23.6	17.4	100.0	100.0	89.2	74.6
<b>LF (%)</b>	91.8	92.8	91.8	76.4	91.8	77.1	-1.4	19.8	12.4	97.7	97.3	81.8	68.9
<b>OF (%)</b>	100.0	100.0	100.0	83.8	100.0	83.3	0.0	23.5	17.4	100.0	100.0	89.1	74.6
<b>EUf (%)</b>	4.4	3.6	4.5	20.8	4.9	21.8	100.0	80.2	87.6	2.3	1.8	15.2	29.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	16.7	100.0	46.2	0.0	0.0	0.0	0.0	13.8
<b>UCLF (%)</b>	0.0	0.0	0.0	16.3	0.0	0.0	0.0	30.3	82.6	0.0	0.0	10.8	11.6
<b>XUF (%)</b>	4.4	3.6	4.5	4.5	4.9	5.0	0.0	3.8	5.0	2.3	1.8	4.4	3.7

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 74.59% AND 75.8% RESPECTIVELY.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1968 **Lifetime Generation:** 29333.6 GW(e)·h  
**Date of First Criticality:** 08 Oct 1980 **Cumulative Energy Availability Factor:** 58.3%  
**Date of Grid Connection:** 01 Nov 1980 **Cumulative Load Factor:** 55.1%  
**Date of Commercial Operation:** 01 Apr 1981 **Cumulative Unit Capability Factor:** 61.4%  
**Cumulative Energy Unavailability Factor:** 41.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	551.9	220	38.4	38.4	38.4	38.4	38.0	38.0	5316	80.5
1982	372.9	206	20.7	28.6	20.7	28.6	20.7	28.4	3651	41.7
1983	957.2	202	54.1	37.6	54.1	37.6	54.1	37.4	6673	76.2
1984	908.7	185	56.1	42.1	49.1	40.4	55.9	42.0	5870	66.8
1985	959.9	184	73.3	48.2	71.3	46.4	59.6	45.4	6243	71.3
1986	1080.5	207	65.2	51.3	59.6	48.8	59.6	47.9	6743	77.0
1987	1031.1	207	63.2	53.1	56.9	50.0	56.9	49.3	6277	71.7
1988	1234.0	207	70.1	55.3	67.9	52.4	67.9	51.8	7935	90.3
1989	1084.2	207	60.5	55.9	59.8	53.3	59.8	52.7	6980	79.7
1990	1173.8	192	68.7	57.2	68.7	54.8	69.8	54.4	7151	81.6
1991	895.1	192	62.9	57.7	62.9	55.5	53.2	54.3	5416	61.8
1992	874.4	184	90.3	60.3	58.1	55.7	54.1	54.3	5297	60.3
1993	1153.5	184	74.2	61.3	71.1	56.8	71.6	55.5	6983	79.7
1994	519.4	184	39.4	59.8	32.2	55.2	32.2	53.9	3244	37.0
1995	0.0	184	0.0	56.0	0.0	51.6	0.0	50.5	0	0.0
1996	0.0	184	0.0	52.6	0.0	48.5	0.0	47.5	0	0.0
1997	0.0	184	0.0	49.7	0.0	45.8	0.0	44.8	0	0.0
1998	512.4	184	49.6	49.7	49.6	46.0	31.8	44.1	3728	42.6
1999	1162.3	184	87.6	51.6	83.1	47.9	72.1	45.5	7264	82.9
2000	1308.1	184	92.3	53.6	92.3	50.0	80.9	47.2	8104	92.3
2001	1348.3	184	86.9	55.1	85.5	51.7	83.6	48.9	7486	85.5
2002	1430.9	187	90.7	56.7	89.0	53.3	87.3	50.6	7768	88.7

2003	1391.5	187	92.3	58.2	84.7	54.7	84.9	52.1	8018	91.5
2004	1047.7	187	77.8	59.0	77.8	55.6	63.8	52.6	6806	77.5
2005	1134.8	187	80.5	59.9	80.0	56.6	69.3	53.2	7581	86.5
2006	1026.8	187	75.9	60.5	70.4	57.1	62.7	53.6	7207	82.3
2007	508.7	187	42.4	59.8	34.0	56.3	31.1	52.8	3758	42.9
2008	0.0	187	0.0	57.7	0.0	54.3	0.0	50.9	0	0.0
2009	470.7	187	31.7	56.8	28.7	53.4	28.7	50.2	2795	31.9
2010	1449.0	187	94.2	58.0	90.5	54.6	88.5	51.4	8286	94.6
2011	1528.8	187	98.9	59.3	98.3	56.0	93.3	52.7	8518	97.2
2012	1304.7	187	81.5	60.0	81.5	56.8	79.4	53.6	7265	82.7
2013	1498.7	187	94.1	61.1	94.1	57.9	91.5	54.7	8327	95.1
2014	1129.4	187	74.6	61.4	70.9	58.3	68.9	55.1	6534	74.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1017			690	
C. Inspection, maintenance or repair combined with refuelling				82		
D. Inspection, maintenance or repair without refuelling	1208			1319	2	
E. Testing of plant systems or components					10	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				544		
H. Nuclear regulatory requirements					3	
J. Grid limitation, failure or grid unavailability						152
L. Human factor related					9	
P. Fire					9	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						12
Z. Other				38	33	1
Subtotal	1208	1017	0	1983	756	165
Total		2225			2904	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		38
12. Reactor I&C Systems	197	132
13. Reactor Auxiliary Systems		15
14. Safety Systems		22
15. Reactor Cooling Systems	73	84
16. Steam generation systems	746	18
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		11
31. Turbine and auxiliaries		205
32. Feedwater and Main Steam System		36
33. Circulating Water System		1
35. All other I&C Systems		12
41. Main Generator Systems		55
42. Electrical Power Supply Systems		45
XX. Miscellaneous Systems		9
Total	1016	684

## IN-11 RAJASTHAN-3

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 6700 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1563.3 GW(e)·h  
**Energy Availability Factor:** 89.5%  
**Load Factor:** 88.3%  
**Operating Factor:** 91.2%  
**Energy Unavailability Factor:** 10.5%  
**Total Off-line Time:** 769 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	154.9	138.6	151.3	143.6	144.6	134.6	128.3	41.8	108.3	142.1	141.6	133.4	1563.3
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	97.0	93.7	86.9	30.5	82.0	96.2	98.9	91.0	89.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	97.1	93.7	86.9	30.5	82.0	96.2	98.9	91.0	89.5
<b>LF (%)</b>	103.1	102.1	100.7	98.7	96.2	92.6	85.4	27.8	74.4	94.6	97.4	88.7	88.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	92.3	30.2	81.8	100.0	100.0	91.7	91.2
<b>EUUF (%)</b>	0.0	0.0	0.0	0.0	3.0	6.3	13.1	69.5	18.0	3.9	1.1	9.0	10.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.0	17.8	0.0	0.0	0.0	7.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	3.0	6.3	13.1	0.5	0.2	3.9	1.1	9.0	3.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IN THE YEAR 2014, UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 91.22% AND 90.86% RESPECTIVELY. IN THIS YEAR BIENNIAL SHUTDOWN OF THE UNIT WAS TAKEN.

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1990 **Lifetime Generation:** 19844.6 GW(e)·h  
**Date of First Criticality:** 24 Dec 1999 **Cumulative Energy Availability Factor:** 78.1%  
**Date of Grid Connection:** 10 Mar 2000 **Cumulative Load Factor:** 75.6%  
**Date of Commercial Operation:** 01 Jun 2000 **Cumulative Unit Capability Factor:** 90.1%  
**Cumulative Energy Unavailability Factor:** 21.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2000	797.7	200	76.4	76.4	76.4	76.4	77.6	77.6	3986	77.6
2001	1366.1	200	84.9	81.7	83.6	80.9	78.0	77.8	7317	83.5
2002	1317.9	202	81.2	81.5	75.5	78.8	74.5	76.5	6715	76.7
2003	1442.1	202	95.3	85.4	84.5	80.4	81.5	77.9	8285	94.6
2004	1260.3	202	90.0	86.4	72.3	78.6	71.0	76.4	7711	87.8
2005	1487.9	202	98.3	88.5	84.6	79.7	84.1	77.8	8581	98.0
2006	985.6	202	83.8	87.8	57.8	76.4	55.7	74.4	7323	83.6
2007	1043.0	202	90.7	88.2	61.1	74.4	58.9	72.4	7934	90.6
2008	952.9	202	87.9	88.1	61.8	72.9	53.7	70.2	7707	87.7
2009	1011.5	202	95.8	88.9	65.5	72.1	57.2	68.8	8338	95.2
2010	1282.1	202	88.0	88.8	74.2	72.3	72.5	69.2	7699	87.9
2011	1675.5	202	94.9	89.4	94.9	74.3	94.7	71.4	8307	94.8
2012	1581.0	202	90.8	89.5	90.2	75.5	89.1	72.8	7932	90.3
2013	1729.8	202	98.2	90.1	98.2	77.2	97.8	74.6	8603	98.2
2014	1563.3	202	89.5	90.1	89.5	78.1	88.3	75.6	7991	91.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2000 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		120			407	
D. Inspection, maintenance or repair	648			384		

without refuelling						
E. Testing of plant systems or components					24	
J. Grid limitation, failure or grid unavailability						48
L. Human factor related					8	
Subtotal	648	120	0	384	439	48
Total	768			871		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2000 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		89
13. Reactor Auxiliary Systems		33
15. Reactor Cooling Systems		24
16. Steam generation systems		27
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		14
31. Turbine and auxiliaries	1	56
32. Feedwater and Main Steam System	0	52
33. Circulating Water System	50	
41. Main Generator Systems	68	47
42. Electrical Power Supply Systems		40
XX. Miscellaneous Systems		3
Total	119	401



## IN-12 RAJASTHAN-4

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 6700 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1778.8 GW(e)·h  
**Energy Availability Factor:** 97.9%  
**Load Factor:** 100.5%  
**Operating Factor:** 97.9%  
**Energy Unavailability Factor:** 2.1%  
**Total Off-line Time:** 185 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	129.1	126.6	157.0	151.2	154.9	146.2	152.1	151.7	147.9	154.4	150.9	156.7	1778.8
<b>EAF (%)</b>	83.6	90.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9
<b>UCF (%)</b>	83.6	90.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9
<b>LF (%)</b>	85.9	93.3	104.5	104.0	103.0	100.5	101.2	101.0	101.7	102.8	103.7	104.3	100.5
<b>OF (%)</b>	83.5	90.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9
<b>EUUF (%)</b>	16.4	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	16.4	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR AND CAPACITY FACTOR OF 97.89% AND 101.99% RESPECTIVELY. UNIT ACHIEVED CAPACITY FACTOR MORE THAN 100% IN SEVERAL MONTHS.

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1990 **Lifetime Generation:** 19522.5 GW(e)·h  
**Date of First Criticality:** 03 Nov 2000 **Cumulative Energy Availability Factor:** 78.7%  
**Date of Grid Connection:** 17 Nov 2000 **Cumulative Load Factor:** 77.1%  
**Date of Commercial Operation:** 23 Dec 2000 **Cumulative Unit Capability Factor:** 91.5%  
**Cumulative Energy Unavailability Factor:** 21.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2000	54.9	200	54.8	54.8	54.8	54.8	36.9	36.9	410	55.1
2001	1200.8	200	82.0	79.9	71.0	69.7	68.5	66.1	6214	70.9
2002	1671.5	202	96.5	87.9	94.3	81.6	94.5	79.8	8255	94.2
2003	1318.2	202	87.6	87.8	74.8	79.4	74.5	78.0	7633	87.1
2004	1447.7	202	95.8	89.7	79.5	79.4	81.6	78.9	8329	94.8
2005	1461.9	202	92.8	90.3	82.3	80.0	82.6	79.6	8074	92.2
2006	1128.1	202	95.2	91.1	64.1	77.4	63.8	77.0	8334	95.1
2007	943.4	202	81.2	89.7	54.7	74.2	53.3	73.7	7101	81.1
2008	1041.6	202	98.2	90.8	69.0	73.5	58.7	71.8	8626	98.2
2009	859.8	202	86.8	90.3	58.5	71.9	48.6	69.3	7542	86.1
2010	1490.5	202	98.2	91.1	84.9	73.2	84.2	70.7	8598	98.2
2011	1435.6	202	83.5	90.4	83.5	74.1	81.1	71.7	7299	83.3
2012	1734.6	202	97.1	91.0	97.1	76.0	97.8	73.8	8512	96.9
2013	1652.0	202	91.4	91.0	91.4	77.2	93.4	75.3	7999	91.3
2014	1778.8	202	97.9	91.5	97.9	78.7	100.5	77.1	8575	97.9

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2000 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		185			249	
D. Inspection, maintenance or repair				341		

without refuelling						
E. Testing of plant systems or components					0	
J. Grid limitation, failure or grid unavailability						76
L. Human factor related					9	
Subtotal	0	185	0	341	258	76
Total		185			675	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2000 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		27
14. Safety Systems		14
15. Reactor Cooling Systems		36
16. Steam generation systems		34
21. Fuel Handling and Storage Facilities		11
31. Turbine and auxiliaries	58	11
32. Feedwater and Main Steam System		32
41. Main Generator Systems	126	13
42. Electrical Power Supply Systems		52
XX. Miscellaneous Systems		5
Total	184	243

## IN-19 RAJASTHAN-5

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 7000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1508.2 GW(e)·h  
**Energy Availability Factor:** 83.8%  
**Load Factor:** 85.2%  
**Operating Factor:** 83.7%  
**Energy Unavailability Factor:** 16.2%  
**Total Off-line Time:** 1431 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	158.6	143.4	158.2	150.6	153.6	143.3	149.4	148.5	25.4	-2.9	133.8	146.3	1508.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	20.4	2.1	91.5	92.8	83.8
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	20.4	2.1	91.5	92.8	83.8
<b>LF (%)</b>	105.5	105.7	105.3	103.5	102.2	98.6	99.4	98.8	17.5	-2.0	92.0	97.3	85.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	19.6	1.1	91.4	92.7	83.7
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.6	97.9	8.5	7.2	16.2
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.6	92.6	0.0	0.0	14.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	8.5	7.2	1.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THIS UNIT COMPLETED THE 765 DAYS OF CONTINUOUS OPERATION BEFORE MANUALLY TRIPPED FOR BIENNIAL SHUTDOWN. THIS IS THE SECOND LONGEST CONTINUOUS OPERATION OF ANY NPP UNIT IN THE WORLD. UNIT ACHIEVED AN ANNUAL CAPACITY FACTOR OF 87.21%. UNIT HAD ONE UNPLANNED AUTO SCRAMS AND THREE UNPLANNED MANUAL SCRAMS WHICH INCLUDE ONE SCRAM DURING STARTUP.

### 5. Historical Summary

**Date of Construction Start:** 18 Sep 2002 **Lifetime Generation:** 8086.3 GW(e)·h  
**Date of First Criticality:** 24 Nov 2009 **Cumulative Energy Availability Factor:** 90.5%  
**Date of Grid Connection:** 22 Dec 2009 **Cumulative Load Factor:** 92.9%  
**Date of Commercial Operation:** 04 Feb 2010 **Cumulative Unit Capability Factor:** 90.8%  
**Cumulative Energy Unavailability Factor:** 9.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2010	1406.2	202	85.7	85.7	85.7	85.7	86.8	86.8	7158	89.3
2011	1741.8	202	96.7	91.4	94.9	90.5	98.4	92.9	8325	95.0
2012	1587.8	202	87.5	90.1	87.5	89.5	89.5	91.7	7590	86.4
2013	1842.3	202	100.0	92.6	100.0	92.2	104.1	94.9	8760	100.0
2014	1508.2	202	83.8	90.8	83.8	90.5	85.2	92.9	7329	83.7

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2010 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		157			220	
D. Inspection, maintenance or repair without refuelling	1274			226		
E. Testing of plant systems or components				5		
J. Grid limitation, failure or grid unavailability						47
L. Human factor related					0	
Subtotal	1274	157	0	231	220	47
Total		1431			498	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2010 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	157	42
12. Reactor I&C Systems		70
15. Reactor Cooling Systems		12
31. Turbine and auxiliaries		28
33. Circulating Water System		28
35. All other I&C Systems		0
41. Main Generator Systems		27
42. Electrical Power Supply Systems		9
Total	157	216

## IN-20 RAJASTHAN-6

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP at the beginning of 2014):** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** 7000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1231.9 GW(e)·h  
**Energy Availability Factor:** 68.4%  
**Load Factor:** 69.6%  
**Operating Factor:** 74.4%  
**Energy Unavailability Factor:** 31.6%  
**Total Off-line Time:** 2246 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	159.0	142.5	158.2	146.1	55.1	28.7	86.8	108.9	95.3	120.1	134.9	-3.9	1231.9
<b>EAF (%)</b>	100.0	99.8	100.0	98.4	35.4	22.5	57.9	73.0	66.6	80.0	88.9	1.0	68.4
<b>UCF (%)</b>	100.0	99.8	100.0	98.4	35.4	22.5	57.9	73.0	66.6	80.0	88.9	1.0	68.4
<b>LF (%)</b>	105.8	105.0	105.3	100.5	36.7	19.8	57.7	72.5	65.5	79.9	92.8	-2.6	69.6
<b>OF (%)</b>	100.0	99.7	100.0	100.0	39.5	27.2	72.4	89.8	82.5	88.6	95.3	0.0	74.4
<b>EUf (%)</b>	0.0	0.2	0.0	1.6	64.6	77.5	42.1	27.0	33.4	20.0	11.1	99.0	31.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.2	0.0	1.6	64.6	77.5	42.1	27.0	33.4	20.0	11.1	99.0	31.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

DURING THE YEAR UNIT ACHIEVED AN ANNUAL CAPACITY FACTOR OF 72.38%. IN SOME MONTHS UNIT OPERATED AT A CAPACITY FACTOR MORE THAN 100%. THERE WERE 2 UNPLANNED AUTOMATIC SCRAMS AND 5 UNPLANNED MANUAL SCRAMS WHICH INCLUDES ONE MANUAL SCRAM DURING START-UP WHEN THE REACTOR WAS CRITICAL BUT UNIT WAS NOT CONNECTED TO GRID.

### 5. Historical Summary

**Date of Construction Start:** 20 Jan 2003 **Lifetime Generation:** 6541.8 GW(e)·h  
**Date of First Criticality:** 23 Jan 2010 **Cumulative Energy Availability Factor:** 76.3%  
**Date of Grid Connection:** 28 Mar 2010 **Cumulative Load Factor:** 77.6%  
**Date of Commercial Operation:** 31 Mar 2010 **Cumulative Unit Capability Factor:** 76.8%  
**Cumulative Energy Unavailability Factor:** 23.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2010	494.8	202	39.0	39.0	39.0	39.0	36.6	36.6	3041	45.4
2011	1570.6	202	87.3	66.4	85.8	65.5	88.8	66.2	7506	85.7
2012	1711.3	202	95.5	76.9	94.8	76.1	96.4	77.1	8317	94.7
2013	1533.2	202	84.9	79.0	84.9	78.5	86.6	79.7	7420	84.7
2014	1231.9	202	68.4	76.8	68.4	76.3	69.6	77.6	6514	74.4

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2010 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2244			984	
D. Inspection, maintenance or repair without refuelling				254		
J. Grid limitation, failure or grid unavailability						38
L. Human factor related					37	
Subtotal	0	2244	0	254	1021	38
Total		2244			1313	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2010 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	155	
12. Reactor I&C Systems	204	
16. Steam generation systems		78
31. Turbine and auxiliaries	779	46
32. Feedwater and Main Steam System		19
35. All other I&C Systems	1	12
41. Main Generator Systems	1049	811
42. Electrical Power Supply Systems	54	17
Total	2242	983

# IN-1 TARAPUR-1

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 150.0 MW(e)  
**Design Net Capacity:** 200.0 MW(e)  
**Design Discharge Burnup:** 21600 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 960.4 GW(e)·h  
**Energy Availability Factor:** 73.1%  
**Load Factor:** 73.1%  
**Operating Factor:** 75.5%  
**Energy Unavailability Factor:** 26.9%  
**Total Off-line Time:** 2148 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	96.3	89.0	111.4	105.0	110.6	104.4	89.5	110.8	106.3	37.2	0.0	0.0	960.4
<b>EAF (%)</b>	86.3	88.3	99.8	97.2	99.1	96.7	80.2	99.3	98.4	33.3	0.0	0.0	73.1
<b>UCF (%)</b>	86.3	88.3	99.8	97.2	99.1	96.7	80.2	99.3	98.4	33.3	0.0	0.0	73.1
<b>LF (%)</b>	86.3	88.3	99.8	97.2	99.1	96.7	80.2	99.3	98.4	33.3	0.0	0.0	73.1
<b>OF (%)</b>	86.6	97.8	100.0	100.0	100.0	100.0	84.9	100.0	100.0	38.6	0.0	0.0	75.5
<b>EUUF (%)</b>	13.7	11.7	0.2	2.8	0.9	3.3	19.8	0.7	1.6	66.7	100.0	100.0	26.9
<b>PUF (%)</b>	13.7	11.7	0.2	2.8	0.9	3.3	19.8	0.7	1.6	66.7	100.0	29.0	20.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71.0	6.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR OF 75.47% AND CAPACITY FACTOR OF 73.98%.

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1964 **Lifetime Generation:** 41159.0 GW(e)·h  
**Date of First Criticality:** 01 Feb 1969 **Cumulative Energy Availability Factor:** 67.9%  
**Date of Grid Connection:** 01 Apr 1969 **Cumulative Load Factor:** 63.1%  
**Date of Commercial Operation:** 28 Oct 1969 **Cumulative Unit Capability Factor:** 68.6%  
**Cumulative Energy Unavailability Factor:** 32.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation								
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online		
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]	
1969	Data not provided										
1970	"										
1971	"										
1972	652.4	210	35.4	35.4	35.4	35.4	35.4	35.4	5071	57.7	
1973	757.1	210	41.2	38.3	41.2	38.3	41.2	38.3	5181	59.1	
1974	832.6	156	60.5	44.3	60.5	44.3	60.9	44.4	6938	79.2	
1975	926.6	200	53.0	46.5	53.0	46.5	52.9	46.6	5825	66.5	
1976	1156.6	210	62.7	50.0	62.7	50.0	62.7	50.0	7617	86.7	
1977	994.8	210	54.1	50.7	54.1	50.7	54.1	50.7	6675	76.2	
1978	941.0	210	51.2	50.8	51.2	50.8	51.2	50.8	6427	73.4	
1979	965.9	210	52.5	51.0	52.5	51.0	52.5	51.0	7143	81.5	
1980	893.9	210	67.8	52.9	67.8	52.9	48.5	50.7	5955	67.8	
1981	793.8	210	68.4	54.5	68.4	54.5	43.2	49.9	5986	68.3	
1982	1112.2	210	89.9	57.8	89.9	57.8	60.5	50.9	7872	89.9	
1983	730.0	200	41.7	56.5	41.7	56.5	41.7	50.2	5396	61.6	
1984	826.9	200	90.3	59.1	89.6	59.0	47.1	49.9	7688	87.5	
1985	790.9	170	64.6	59.4	64.6	59.3	53.2	50.1	6194	70.7	
1986	1090.2	150	84.6	60.7	83.0	60.5	83.0	51.8	7954	90.8	
1987	193.4	150	14.7	58.5	14.7	58.3	14.7	50.0	1533	17.5	
1988	1085.5	150	83.8	59.6	82.4	59.4	82.4	51.5	8010	91.2	
1989	800.3	150	61.6	59.7	61.4	59.5	60.9	51.9	6177	70.5	
1990	1045.2	150	80.5	60.6	80.2	60.4	79.5	53.1	7772	88.7	
1991	566.9	150	82.4	61.5	80.4	61.2	43.1	52.7	6536	74.6	

1992	762.3	150	58.7	61.4	57.9	61.1	57.9	52.9	5487	62.5
1993	967.7	150	76.9	61.9	74.4	61.6	73.6	53.6	7291	83.2
1994	280.6	150	22.9	60.5	21.4	60.1	21.4	52.5	2450	28.0
1995	1092.3	150	91.0	61.6	83.1	60.9	83.1	53.5	7893	90.1
1996	403.3	150	32.3	60.6	30.6	59.9	30.6	52.8	3872	44.1
1997	985.5	150	75.9	61.1	75.0	60.4	75.0	53.5	7347	83.9
1998	1162.6	150	92.8	62.1	91.6	61.4	88.5	54.6	8283	94.6
1999	852.6	150	67.9	62.3	67.0	61.5	64.9	54.9	6405	73.1
2000	1181.1	150	91.6	63.1	91.6	62.4	89.6	55.9	8337	94.9
2001	1084.2	150	84.3	63.8	83.6	63.0	82.5	56.7	7635	87.2
2002	1180.7	150	93.8	64.6	92.0	63.9	89.9	57.6	8394	95.8
2003	1100.4	150	86.9	65.2	85.2	64.4	83.7	58.3	7901	90.2
2004	1148.6	150	90.9	65.9	89.0	65.1	87.2	59.1	8111	92.3
2005	965.0	150	74.2	66.1	74.2	65.3	73.4	59.5	6552	74.8
2006	938.7	150	71.9	66.2	71.4	65.5	71.4	59.8	6652	75.9
2007	1218.3	150	93.6	66.9	92.7	66.1	92.7	60.6	8400	95.9
2008	964.8	150	80.2	67.2	78.2	66.4	73.2	60.9	7045	80.2
2009	1205.6	150	88.2	67.7	88.2	66.9	91.8	61.6	7752	88.5
2010	976.8	150	74.0	67.9	74.0	67.1	74.3	61.9	6792	77.5
2011	1251.0	150	96.0	68.5	96.0	67.7	95.2	62.6	8437	96.3
2012	687.7	150	53.6	68.2	52.1	67.4	52.2	62.4	4750	54.1
2013	1120.5	150	84.6	68.5	84.6	67.8	85.3	62.9	7606	86.8
2014	960.4	150	73.1	68.6	73.1	67.9	73.1	63.1	6612	75.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					337	
C. Inspection, maintenance or repair combined with refuelling	1394	528		1287	16	
D. Inspection, maintenance or repair without refuelling	228			208		
E. Testing of plant systems or components				7	1	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				75		
J. Grid limitation, failure or grid unavailability						46
L. Human factor related					0	
Z. Other				0	1	1
Subtotal	1622	528	0	1577	355	47
Total	2150			1979		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		10
13. Reactor Auxiliary Systems		1
14. Safety Systems		1
15. Reactor Cooling Systems		66
16. Steam generation systems		15
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		135
32. Feedwater and Main Steam System		68
41. Main Generator Systems		0
42. Electrical Power Supply Systems		27
XX. Miscellaneous Systems		0
Total	0	332



## IN-2 TARAPUR-2

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 150.0 MW(e)  
**Design Net Capacity:** 200.0 MW(e)  
**Design Discharge Burnup:** 21600 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 1275.9 GW(e)·h  
**Energy Availability Factor:** 96.6%  
**Load Factor:** 97.1%  
**Operating Factor:** 98.7%  
**Energy Unavailability Factor:** 3.4%  
**Total Off-line Time:** 112 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	115.4	103.7	97.3	108.1	110.7	90.7	107.5	111.2	107.3	108.5	107.5	107.9	1275.9
<b>EAF (%)</b>	100.0	100.0	87.2	100.0	99.2	84.0	96.3	99.7	99.3	97.2	99.5	96.7	96.6
<b>UCF (%)</b>	100.0	100.0	87.2	100.0	99.2	84.0	96.3	99.7	99.3	97.3	99.5	96.7	96.6
<b>LF (%)</b>	103.4	102.9	87.2	100.1	99.2	84.0	96.3	99.7	99.3	97.2	99.5	96.7	97.1
<b>OF (%)</b>	100.0	100.0	89.1	100.0	100.0	95.7	100.0	100.0	100.0	100.0	100.0	100.0	98.7
<b>EUf (%)</b>	0.0	0.0	12.8	0.0	0.8	16.0	3.7	0.3	0.7	2.8	0.5	3.3	3.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.8	16.0	3.7	0.3	0.7	2.8	0.5	0.0	2.1
<b>UCLF (%)</b>	0.0	0.0	12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	1.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR OF 98.72% AND CAPACITY FACTOR OF 97.12%.

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1964      **Lifetime Generation:** 42015.8 GW(e)·h  
**Date of First Criticality:** 28 Feb 1969      **Cumulative Energy Availability Factor:** 67.6%  
**Date of Grid Connection:** 05 May 1969      **Cumulative Load Factor:** 63.9%  
**Date of Commercial Operation:** 28 Oct 1969      **Cumulative Unit Capability Factor:** 68.4%  
**Cumulative Energy Unavailability Factor:** 32.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation								
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online		
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]	
1969	Data not provided										
1970	"										
1971	"										
1972	218.0	210	11.8	11.8	11.8	11.8	11.8	11.8	1987	22.6	
1973	1249.6	210	67.9	39.8	67.9	39.8	67.9	39.8	7402	84.5	
1974	597.0	194	35.2	38.4	35.0	38.3	35.1	38.3	4016	45.8	
1975	925.8	200	52.8	41.9	52.8	41.9	52.8	41.9	5654	64.5	
1976	1137.9	210	61.7	46.0	61.7	45.9	61.7	46.0	6534	74.4	
1977	1161.5	210	68.2	49.7	68.2	49.7	63.1	48.9	7650	87.3	
1978	1146.1	210	62.3	51.6	62.3	51.6	62.3	50.8	6678	76.2	
1979	993.0	210	53.9	51.9	53.9	51.8	54.0	51.2	6216	71.0	
1980	899.9	210	78.4	54.9	78.4	54.8	48.8	51.0	6883	78.4	
1981	964.0	210	77.1	57.1	77.1	57.1	52.4	51.1	6748	77.0	
1982	556.7	210	55.4	56.9	55.4	56.9	30.3	49.2	4844	55.3	
1983	867.7	200	49.5	56.4	49.5	56.3	49.5	49.2	7519	85.8	
1984	803.1	200	70.6	57.4	69.6	57.3	45.7	49.0	5615	63.9	
1985	1070.9	170	83.4	59.0	83.4	58.9	72.0	50.3	8059	92.0	
1986	769.5	150	58.9	59.0	58.6	58.9	58.6	50.7	5615	64.1	
1987	1167.2	150	91.5	60.5	88.8	60.3	88.8	52.5	8221	93.8	
1988	813.5	150	62.1	60.6	61.7	60.4	61.7	53.0	6077	69.2	
1989	427.1	150	34.8	59.5	34.8	59.2	32.5	52.1	3052	34.8	
1990	762.4	150	58.7	59.4	58.7	59.2	58.0	52.3	7827	89.3	
1991	848.5	150	76.4	60.1	75.0	59.9	64.6	52.8	6265	71.5	

1992	819.8	150	62.8	60.2	62.2	60.0	62.2	53.2	6076	69.2
1993	779.7	150	60.7	60.2	59.3	59.9	59.3	53.4	5750	65.6
1994	843.6	150	64.9	60.4	64.2	60.1	64.2	53.8	6722	76.7
1995	640.0	150	55.6	60.2	48.7	59.7	48.7	53.6	4911	56.1
1996	361.2	150	30.4	59.2	27.4	58.6	27.4	52.7	3203	36.5
1997	775.7	150	59.6	59.2	59.0	58.6	59.0	52.9	6978	79.7
1998	881.1	150	71.2	59.6	67.8	58.9	67.1	53.4	6522	74.5
1999	1103.5	150	87.6	60.5	86.4	59.7	84.0	54.3	7711	88.0
2000	1023.1	150	79.0	61.0	79.0	60.3	77.6	55.0	7162	81.5
2001	1197.4	150	93.9	62.0	93.3	61.2	91.1	56.0	8364	95.5
2002	1163.3	150	90.8	62.8	90.2	62.1	88.5	56.9	7978	91.1
2003	1117.1	150	86.1	63.4	85.9	62.7	85.0	57.7	7890	90.1
2004	1238.3	150	95.2	64.2	94.5	63.5	94.0	58.6	8455	96.3
2005	893.3	150	70.7	64.4	68.9	63.7	68.0	58.9	6359	72.6
2006	1090.9	150	83.9	64.9	82.7	64.1	83.0	59.5	7439	84.9
2007	1142.4	150	87.2	65.4	86.5	64.7	86.9	60.2	7812	89.2
2008	1265.0	150	97.3	66.2	95.8	65.4	96.0	61.0	8462	96.3
2009	1201.4	150	88.6	66.7	88.1	66.0	91.4	61.7	7878	89.9
2010	1309.3	150	98.9	67.4	98.9	66.7	99.6	62.6	8760	100.0
2011	1149.6	150	87.5	67.9	87.5	67.2	87.5	63.1	7857	89.7
2012	1255.5	150	98.1	68.5	95.3	67.8	95.3	63.8	8723	99.3
2013	424.4	150	32.3	67.8	32.3	67.0	32.3	63.2	2982	34.0
2014	1275.9	150	96.6	68.4	96.6	67.6	97.1	63.9	8648	98.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					473	
C. Inspection, maintenance or repair combined with refuelling				1282		
D. Inspection, maintenance or repair without refuelling	31			191		
E. Testing of plant systems or components		81		1	4	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				51		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				25		
H. Nuclear regulatory requirements				0	5	
J. Grid limitation, failure or grid unavailability						45
L. Human factor related					1	
Z. Other					1	1
Subtotal	31	81	0	1550	484	46
Total		112			2080	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		17
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		40
14. Safety Systems		4
15. Reactor Cooling Systems		67
16. Steam generation systems		13
31. Turbine and auxiliaries		58
32. Feedwater and Main Steam System		53
41. Main Generator Systems		96
42. Electrical Power Supply Systems		99
XX. Miscellaneous Systems		15
Total	0	469

## IN-23 TARAPUR-3

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 490.0 MW(e)  
**Design Net Capacity:** 502.0 MW(e)  
**Design Discharge Burnup:** 7000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 4130.0 GW(e)·h  
**Energy Availability Factor:** 95.8%  
**Load Factor:** 96.2%  
**Operating Factor:** 96.6%  
**Energy Unavailability Factor:** 4.2%  
**Total Off-line Time:** 297 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	293.8	328.8	350.2	355.4	360.1	262.5	365.8	367.0	356.7	366.6	356.3	366.9	4130.0
<b>EAF (%)</b>	80.6	99.9	96.0	100.0	98.8	74.4	100.0	100.0	100.0	99.9	100.0	100.0	95.8
<b>UCF (%)</b>	83.2	100.0	100.0	100.0	98.8	76.2	100.0	100.0	100.0	100.0	100.0	100.0	96.5
<b>LF (%)</b>	80.6	99.9	96.0	100.7	98.8	74.4	100.3	100.7	101.1	100.6	101.0	100.6	96.2
<b>OF (%)</b>	83.2	100.0	100.0	100.0	100.0	76.3	100.0	100.0	100.0	99.9	100.0	100.0	96.6
<b>EUf (%)</b>	19.4	0.1	4.0	0.0	1.2	25.6	0.0	0.0	0.0	0.1	0.0	0.0	4.2
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	16.8	0.0	0.0	0.0	1.2	23.8	0.0	0.0	0.0	0.0	0.0	0.0	3.5
<b>XUF (%)</b>	2.6	0.1	4.0	0.0	0.0	1.8	0.0	0.0	0.0	0.1	0.0	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR OF 96.61% AND CAPACITY FACTOR OF 96.12%. IN FEW MONTHS UNIT OPERATED AT A REDUCE POWER LEVEL OF 96% TO 99%.

### 5. Historical Summary

**Date of Construction Start:** 12 May 2000 **Lifetime Generation:** 25599.1 GW(e)·h  
**Date of First Criticality:** 21 May 2006 **Cumulative Energy Availability Factor:** 73.1%  
**Date of Grid Connection:** 15 Jun 2006 **Cumulative Load Factor:** 70.5%  
**Date of Commercial Operation:** 18 Aug 2006 **Cumulative Unit Capability Factor:** 89.9%  
**Cumulative Energy Unavailability Factor:** 26.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2006	909.1	490	66.0	66.0	47.5	47.5	50.5	50.5	2523	68.7
2007	2482.8	490	92.1	84.4	66.2	60.7	57.8	55.7	7967	90.9
2008	1594.4	490	85.6	84.9	44.3	53.9	37.0	48.0	7465	85.0
2009	2225.0	490	91.6	86.8	60.1	55.7	51.8	49.1	8022	91.6
2010	2794.0	490	91.0	87.8	65.1	57.8	65.1	52.7	7972	91.0
2011	4122.2	490	100.0	90.0	95.8	64.8	96.0	60.7	8760	100.0
2012	3779.5	490	90.2	90.1	87.7	68.4	87.8	64.9	7923	90.2
2013	3447.3	490	82.1	89.0	80.2	70.0	80.3	67.0	7200	82.2
2014	4130.0	490	96.5	89.9	95.8	73.1	96.2	70.5	8463	96.6

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2006 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		296			386	
D. Inspection, maintenance or repair without refuelling				320		
E. Testing of plant systems or components				19	10	
J. Grid limitation, failure or grid unavailability			0			17
L. Human factor related					46	
P. Fire					2	

Subtotal	0	296	0	339	444	17
Total	296			800		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2006 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	296	100
14. Safety Systems		15
15. Reactor Cooling Systems		119
31. Turbine and auxiliaries		108
32. Feedwater and Main Steam System		16
33. Circulating Water System		9
41. Main Generator Systems		18
42. Electrical Power Supply Systems		0
Total	296	385

## IN-24 TARAPUR-4

**Operator:** NPCIL ('Nuclear Power Corporation Of India Ltd.)

**Contractor:** NPCIL (NUCLEAR POWER CORPORATION OF INDIA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 490.0 MW(e)  
**Design Net Capacity:** 502.0 MW(e)  
**Design Discharge Burnup:** 7000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 3722.2 GW(e)·h  
**Energy Availability Factor:** 86.7%  
**Load Factor:** 86.7%  
**Operating Factor:** 96.0%  
**Energy Unavailability Factor:** 13.3%  
**Total Off-line Time:** 351 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	329.5	328.8	319.2	275.0	277.3	319.0	356.3	342.9	326.4	332.0	319.9	195.9	3722.2
<b>EAF (%)</b>	90.4	99.8	87.6	77.9	76.1	90.4	97.7	94.1	92.5	91.1	90.7	53.7	86.7
<b>UCF (%)</b>	92.2	100.0	100.0	78.0	76.1	90.4	100.0	100.0	100.0	99.9	100.0	60.6	91.4
<b>LF (%)</b>	90.4	99.8	87.6	77.9	76.1	90.4	97.7	94.1	92.5	91.1	90.7	53.7	86.7
<b>OF (%)</b>	92.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	60.6	96.0
<b>EUf (%)</b>	9.6	0.2	12.4	22.1	23.9	9.6	2.3	5.9	7.5	8.9	9.3	46.3	13.3
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.4	3.3
<b>UCLF (%)</b>	7.8	0.0	0.0	22.1	23.9	9.6	0.0	0.0	0.0	0.1	0.0	0.0	5.3
<b>XUF (%)</b>	1.8	0.2	12.4	0.0	0.0	0.0	2.3	5.9	7.5	8.9	9.3	6.9	4.6

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR OF 95.99% AND CAPACITY FACTOR OF 87.29%. DURING THE YEAR UNIT OPERATED AT A REDUCE POWER LEVEL OF 80% TO 99% FULL POWER DUE TO MISMATCH IN FUEL DEMAND AND SUPPLY.

### 5. Historical Summary

**Date of Construction Start:** 08 Mar 2000 **Lifetime Generation:** 24482.6 GW(e)·h  
**Date of First Criticality:** 06 Mar 2005 **Cumulative Energy Availability Factor:** 63.4%  
**Date of Grid Connection:** 04 Jun 2005 **Cumulative Load Factor:** 60.9%  
**Date of Commercial Operation:** 12 Sep 2005 **Cumulative Unit Capability Factor:** 84.8%  
**Cumulative Energy Unavailability Factor:** 36.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2005	942.8	490	77.4	77.4	73.8	73.8	65.7	65.7	2227	76.0
2006	1762.1	490	65.2	68.3	39.0	47.7	41.1	47.2	5454	62.3
2007	2033.0	490	78.5	72.7	54.4	50.6	47.4	47.3	6797	77.6
2008	1709.8	490	91.3	78.3	47.4	49.6	39.7	45.0	8022	91.3
2009	2229.3	490	93.5	81.8	60.0	52.0	51.9	46.6	8187	93.5
2010	2571.8	490	85.9	82.6	59.9	53.5	59.9	49.1	7526	85.9
2011	2518.9	490	75.0	81.4	58.8	54.3	58.7	50.6	6568	75.0
2012	3402.7	490	96.1	83.4	79.1	57.7	79.1	54.5	8440	96.1
2013	3530.4	490	88.8	84.0	82.2	60.6	82.2	57.8	7779	88.8
2014	3722.2	490	91.4	84.8	86.7	63.4	86.7	60.9	8409	96.0

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2005 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		58			789	
D. Inspection, maintenance or repair without refuelling	292			344		
E. Testing of plant systems or components				31		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				71		

J. Grid limitation, failure or grid unavailability						47
L. Human factor related					30	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						41
Z. Other					5	
Subtotal	292	58	0	446	824	88
Total	350			1358		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2005 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		86
12. Reactor I&C Systems		213
13. Reactor Auxiliary Systems		60
14. Safety Systems		26
15. Reactor Cooling Systems		12
16. Steam generation systems		8
21. Fuel Handling and Storage Facilities		97
31. Turbine and auxiliaries	0	32
32. Feedwater and Main Steam System		10
33. Circulating Water System		26
35. All other I&C Systems		0
41. Main Generator Systems		114
42. Electrical Power Supply Systems	58	86
XX. Miscellaneous Systems		12
Total	58	782

# IR-1 BUSHEHR-1

**Operator:** NPPDCO (Nuclear Power Production & Development Co. of Iran)

**Contractor:** ASE (Joint-Stock Company ATOMSTROYEXPORT)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 915.0 MW(e)  
**Design Net Capacity:** 915.0 MW(e)  
**Design Discharge Burnup:** 43000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 3723.6 GW(e)·h  
**Energy Availability Factor:** 56.4%  
**Load Factor:** 46.5%  
**Operating Factor:** 59.1%  
**Energy Unavailability Factor:** 43.6%  
**Total Off-line Time:** 3579 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	598.3	57.5	0.0	0.0	0.0	80.9	642.3	606.6	406.0	440.7	445.9	445.3	3723.6
<b>EAF (%)</b>	88.0	9.3	0.0	0.0	0.0	12.3	94.1	97.1	100.0	93.0	82.4	94.6	56.4
<b>UCF (%)</b>	88.0	9.4	0.0	0.0	0.0	12.3	94.1	97.1	100.0	93.0	82.4	95.1	56.4
<b>LF (%)</b>	87.9	9.3	0.0	0.0	0.0	12.3	94.3	89.1	61.6	64.7	67.7	65.4	46.5
<b>OF (%)</b>	96.6	12.6	0.0	0.0	0.0	16.7	96.1	99.1	91.4	95.2	100.0	96.6	59.1
<b>EUUF (%)</b>	12.0	90.7	100.0	100.0	100.0	87.7	5.9	2.9	0.0	7.0	17.6	5.4	43.6
<b>PUF (%)</b>	0.0	86.9	100.0	100.0	0.0	0.3	1.2	0.0	0.0	0.0	0.0	0.0	23.5
<b>UCLF (%)</b>	12.0	3.8	0.0	0.0	100.0	87.4	4.7	2.9	0.0	7.0	17.6	4.9	20.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 May 1975  
**Date of First Criticality:** 08 May 2011  
**Date of Grid Connection:** 03 Sep 2011  
**Date of Commercial Operation:** 23 Sep 2013

**Lifetime Generation:** 9267.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 66.4%  
**Cumulative Load Factor:** 57.9%  
**Cumulative Unit Capability Factor:** 66.4%  
**Cumulative Energy Unavailability Factor:** 33.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2013	2471.9	915	96.3	96.3	96.3	96.3	92.3	92.3	2728	93.2
2014	3723.6	915	56.4	66.4	56.4	66.4	46.5	57.9	5181	59.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2013 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		177			44	
C. Inspection, maintenance or repair combined with refuelling	2051	1301				
Subtotal	2051	1478	0	0	44	0
Total		3529			44	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2013 to 2014 Average Hours Lost Per Year
16. Steam generation systems		32
31. Turbine and auxiliaries	40	
32. Feedwater and Main Steam System	87	
41. Main Generator Systems	50	
42. Electrical Power Supply Systems		11
Total	177	43

# JP-25 FUKUSHIMA-DAINI-1

**Operator:** TEPCO (Tokyo Electric Power Company)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 16 Mar 1976 **Lifetime Generation:** 205649.0 GW(e)·h  
**Date of First Criticality:** 17 Jun 1981 **Cumulative Energy Availability Factor:** 67.4%  
**Date of Grid Connection:** 31 Jul 1981 **Cumulative Load Factor:** 66.8%  
**Date of Commercial Operation:** 20 Apr 1982 **Cumulative Unit Capability Factor:** 67.6%  
**Cumulative Energy Unavailability Factor:** 32.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1982	6738.3	1067	95.7	95.7	95.7	95.7	95.7	95.7	6522	98.8
1983	6282.2	1067	67.2	79.4	67.2	79.4	67.2	79.4	6130	70.0
1984	6344.4	1067	68.6	75.5	68.6	75.5	67.7	75.2	6175	70.3
1985	8152.9	1067	88.0	78.8	88.0	78.8	87.2	78.4	7776	88.8
1986	7741.0	1067	83.6	79.8	83.6	79.8	82.8	79.3	7404	84.5
1987	6992.1	1067	75.8	79.1	75.8	79.1	74.8	78.5	6710	76.6
1988	5959.3	1067	64.4	76.9	64.4	76.9	63.6	76.3	5744	65.4
1989	6246.2	1067	67.4	75.7	67.4	75.7	66.8	75.1	6029	68.8
1990	8217.0	1067	88.9	77.2	88.9	77.2	87.9	76.6	7914	90.3
1991	6191.1	1067	67.2	76.2	67.2	76.2	66.2	75.5	5927	67.7
1992	6901.5	1067	75.1	76.1	74.6	76.0	73.6	75.3	6656	75.8
1993	5613.1	1067	60.9	74.8	60.9	74.8	60.1	74.0	5384	61.5
1994	8309.1	1067	90.1	76.0	90.1	76.0	88.9	75.2	7936	90.6
1995	7727.5	1067	83.5	76.5	83.5	76.5	82.7	75.7	7333	83.7
1996	6761.4	1067	73.1	76.3	73.1	76.3	72.1	75.5	6425	73.1
1997	7304.8	1067	79.2	76.5	79.2	76.5	78.2	75.7	6993	79.8
1998	7694.1	1067	83.3	76.9	83.3	76.9	82.3	76.1	7318	83.5
1999	7389.4	1067	80.0	77.1	80.0	77.0	79.1	76.2	7011	80.0
2000	8229.0	1067	89.1	77.7	89.1	77.7	87.8	76.8	7824	89.1
2001	5902.6	1067	64.4	77.0	64.4	77.0	63.2	76.2	5645	64.4
2002	9238.2	1067	100.0	78.1	99.9	78.1	98.8	77.2	8760	100.0
2003	3239.3	1067	34.9	76.2	34.9	76.1	34.7	75.3	3061	34.9
2004	6749.7	1067	73.2	76.0	72.6	76.0	72.0	75.1	6522	74.2
2005	5606.2	1067	60.3	75.4	60.3	75.3	60.0	74.5	5382	61.4



2006	6846.8	1067	73.5	75.3	73.5	75.2	73.3	74.5	6473	73.9
2007	6891.7	1067	74.3	75.3	74.2	75.2	73.7	74.4	6547	74.7
2008	9333.7	1067	100.0	76.2	100.0	76.1	99.6	75.4	8784	100.0
2009	7494.0	1067	80.7	76.3	80.7	76.3	80.2	75.5	7096	81.0
2010	6666.8	1067	71.4	76.2	71.4	76.1	71.3	75.4	6304	72.0
2011	1774.1	1067	24.7	74.4	19.1	74.2	19.0	73.5	1671	19.1
2012	0.0	1067	0.0	72.0	0.0	71.8	0.0	71.1	0	0.0
2013	0.0	1067	0.0	69.7	0.0	69.5	0.0	68.9	0	0.0
2014	0.0	1067	0.0	67.6	0.0	67.4	0.0	66.8	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					292	
C. Inspection, maintenance or repair combined with refuelling				1419		
D. Inspection, maintenance or repair without refuelling				28		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			710		
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						14
Subtotal	8760	0	0	2157	293	14
Total	8760			2464		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		193
13. Reactor Auxiliary Systems		15
14. Safety Systems		6
15. Reactor Cooling Systems		38
31. Turbine and auxiliaries		14
35. All other I&C Systems		9
41. Main Generator Systems		1
42. Electrical Power Supply Systems		12
Total	0	288

## JP-26 FUKUSHIMA-DAINI-2

Operator: TEPCO (Tokyo Electric Power Company)

Contractor: HITACHI (HITACHI LTD.)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1067.0 MW(e)

Design Net Capacity: 1067.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 25 May 1979      Lifetime Generation: 190641.0 GW(e)·h

Date of First Criticality: 26 Apr 1983      Cumulative Energy Availability Factor: 65.7%

Date of Grid Connection: 23 Jun 1983      Cumulative Load Factor: 65.3%

Date of Commercial Operation: 03 Feb 1984      Cumulative Unit Capability Factor: 65.9%

   Cumulative Energy Unavailability Factor: 34.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	8480.8	1067	98.9	98.9	98.9	98.9	98.9	98.9	8040	100.0
1985	6760.1	1067	72.9	85.3	72.9	85.3	72.3	85.0	6534	74.6
1986	7063.9	1067	76.2	82.2	76.2	82.2	75.6	81.8	6727	76.8
1987	6844.9	1067	74.3	80.2	74.3	80.2	73.2	79.6	6607	75.4
1988	7628.4	1067	82.1	80.6	82.1	80.6	81.4	80.0	7238	82.4
1989	8308.8	1067	89.4	82.1	89.4	82.1	88.9	81.5	7920	90.4
1990	6261.3	1067	67.3	79.9	67.3	79.9	67.0	79.4	5956	68.0
1991	6887.3	1067	74.3	79.2	74.3	79.2	73.7	78.7	6579	75.1
1992	8116.3	1067	87.1	80.1	87.1	80.1	86.6	79.6	7656	87.2
1993	6785.7	1067	73.2	79.4	73.2	79.4	72.6	78.9	6427	73.4
1994	7058.2	1067	76.0	79.1	76.0	79.1	75.5	78.5	6696	76.4
1995	6786.7	1067	73.1	78.6	73.1	78.6	72.6	78.0	6435	73.5
1996	9327.9	1067	100.0	80.3	100.0	80.3	99.5	79.7	8784	100.0
1997	7405.6	1067	79.8	80.2	79.8	80.2	79.2	79.7	7021	80.1
1998	7447.1	1067	80.2	80.2	80.2	80.2	79.7	79.7	7104	81.1
1999	8231.6	1067	88.7	80.8	88.6	80.8	88.1	80.2	7765	88.6
2000	8874.5	1067	95.2	81.6	95.2	81.6	94.7	81.1	8372	95.3
2001	6761.9	1067	73.1	81.1	73.1	81.1	72.3	80.6	6378	72.8
2002	4645.2	1067	50.2	79.5	50.2	79.5	49.7	78.9	4398	50.2
2003	0.0	1067	0.0	75.5	0.0	75.5	0.0	75.0	0	0.0
2004	3169.8	1067	33.9	73.5	33.9	73.5	33.8	73.0	2978	33.9
2005	7593.5	1067	81.3	73.9	81.2	73.9	81.2	73.4	7128	81.4
2006	7858.2	1067	84.3	74.3	84.3	74.3	84.1	73.9	7413	84.6
2007	4793.1	1067	51.8	73.4	51.6	73.4	51.3	72.9	4593	52.4

2008	7896.3	1067	84.4	73.8	84.4	73.8	84.2	73.4	7416	84.4
2009	9020.9	1067	96.7	74.7	96.6	74.7	96.5	74.3	8497	97.0
2010	7003.6	1067	75.3	74.7	75.3	74.7	74.9	74.3	6625	75.6
2011	1777.5	1067	24.7	72.9	19.1	72.7	19.0	72.3	1671	19.1
2012	0.0	1067	0.0	70.4	0.0	70.2	0.0	69.8	0	0.0
2013	0.0	1067	0.0	68.1	0.0	67.9	0.0	67.5	0	0.0
2014	0.0	1067	0.0	65.9	0.0	65.7	0.0	65.3	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					204	
C. Inspection, maintenance or repair combined with refuelling				1508		
D. Inspection, maintenance or repair without refuelling				123		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			804		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						16
Z. Other					120	
Subtotal	8760	0	0	2435	324	16
Total	8760			2775		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		96
12. Reactor I&C Systems		76
13. Reactor Auxiliary Systems		17
14. Safety Systems		5
15. Reactor Cooling Systems		8
Total	0	202

# JP-35 FUKUSHIMA-DAINI-3

**Operator:** TEPCO (Tokyo Electric Power Company)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 23 Mar 1981  
**Date of First Criticality:** 18 Oct 1984  
**Date of Grid Connection:** 14 Dec 1984  
**Date of Commercial Operation:** 21 Jun 1985

**Lifetime Generation:** 163053.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 59.2%  
**Cumulative Load Factor:** 58.4%  
**Cumulative Unit Capability Factor:** 59.4%  
**Cumulative Energy Unavailability Factor:** 40.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	4851.3	1067	95.4	95.4	95.4	95.4	88.5	88.5	4707	91.6
1986	6837.4	1067	74.4	82.1	74.4	82.1	73.2	78.8	6559	74.9
1987	7459.9	1067	80.8	81.6	80.8	81.6	79.8	79.2	7104	81.1
1988	8389.1	1067	90.7	84.2	90.7	84.2	89.5	82.1	8126	92.5
1989	120.2	1067	1.3	66.1	1.3	66.1	1.3	64.5	144	1.6
1990	912.9	1067	9.8	56.0	9.8	56.0	9.8	54.7	1037	11.8
1991	7695.1	1067	83.1	60.1	83.1	60.1	82.3	58.9	7344	83.8
1992	7533.2	1067	81.3	62.9	81.3	62.9	80.4	61.7	7195	81.9
1993	6810.5	1067	73.8	64.2	73.8	64.2	72.9	63.0	6494	74.1
1994	4841.6	1067	52.5	63.0	52.5	63.0	51.8	61.9	4669	53.3
1995	8992.5	1067	97.2	66.2	97.2	66.2	96.2	65.1	8557	97.7
1996	8060.6	1067	87.0	68.0	87.0	68.0	86.0	66.9	7642	87.0
1997	7487.4	1067	81.2	69.0	81.2	69.0	80.1	68.0	7120	81.3
1998	8284.7	1067	89.9	70.6	89.7	70.6	88.6	69.5	7905	90.2
1999	8566.8	1067	92.7	72.1	92.7	72.1	91.7	71.0	8127	92.8
2000	7643.9	1067	82.5	72.8	82.5	72.8	81.6	71.7	7258	82.6
2001	3288.0	1067	35.9	70.6	35.8	70.5	35.2	69.5	3185	36.4
2002	6123.4	1067	66.3	70.3	66.3	70.3	65.5	69.2	5806	66.3
2003	0.0	1067	0.0	66.5	0.0	66.5	0.0	65.5	0	0.0
2004	6862.3	1067	73.7	66.9	73.7	66.9	73.2	65.9	6508	74.1
2005	359.5	1067	4.0	63.8	4.0	63.8	3.8	62.9	390	4.5
2006	8677.4	1067	93.6	65.2	93.6	65.2	92.8	64.3	8221	93.8
2007	6442.9	1067	69.8	65.4	69.8	65.4	68.9	64.5	6154	70.3
2008	6730.2	1067	72.6	65.7	72.5	65.7	71.8	64.8	6427	73.2

2009	9283.3	1067	99.9	67.1	99.9	67.1	99.3	66.2	8760	100.0
2010	7564.5	1067	81.6	67.7	81.4	67.7	80.9	66.8	7186	82.0
2011	1759.2	1067	24.6	66.1	19.1	65.8	18.8	65.0	1671	19.1
2012	0.0	1067	0.0	63.7	0.0	63.4	0.0	62.6	0	0.0
2013	0.0	1067	0.0	61.4	0.0	61.2	0.0	60.4	0	0.0
2014	0.0	1067	0.0	59.4	0.0	59.2	0.0	58.4	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					505	
C. Inspection, maintenance or repair combined with refuelling				1688		
D. Inspection, maintenance or repair without refuelling				45		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			804		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						16
Z. Other					151	
Subtotal	8760	0	0	2537	656	16
Total	8760			3209		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		119
12. Reactor I&C Systems		165
15. Reactor Cooling Systems		211
32. Feedwater and Main Steam System		10
Total	0	505

# JP-38 FUKUSHIMA-DAINI-4

Operator: TEPCO (Tokyo Electric Power Company)

Contractor: HITACHI (HITACHI LTD.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1067.0 MW(e)

Design Net Capacity: 1067.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 28 May 1981      Lifetime Generation: 161361.0 GW(e)·h

Date of First Criticality: 24 Oct 1986      Cumulative Energy Availability Factor: 62.8%

Date of Grid Connection: 17 Dec 1986      Cumulative Load Factor: 62.2%

Date of Commercial Operation: 25 Aug 1987      Cumulative Unit Capability Factor: 63.0%

   Cumulative Energy Unavailability Factor: 37.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	3642.2	1067	100.0	100.0	100.0	100.0	93.0	93.0	3463	94.3
1988	7010.3	1067	75.5	82.7	75.5	82.7	74.8	80.2	6739	76.7
1989	9137.9	1067	99.2	89.6	99.2	89.6	97.8	87.4	8728	99.6
1990	7051.4	1067	76.0	85.6	76.0	85.6	75.4	83.9	6757	77.1
1991	7278.9	1067	79.0	84.1	79.0	84.1	77.9	82.6	7029	80.2
1992	5901.7	1067	63.8	80.4	63.5	80.3	63.0	78.9	5646	64.3
1993	9049.0	1067	97.6	83.1	97.5	83.0	96.8	81.7	8608	98.3
1994	6735.5	1067	73.5	81.8	72.7	81.6	72.1	80.4	6481	74.0
1995	7782.7	1067	83.9	82.0	83.9	81.9	83.3	80.8	7385	84.3
1996	6842.6	1067	73.7	81.1	73.7	81.0	73.0	79.9	6470	73.7
1997	9275.9	1067	99.9	82.9	99.9	82.8	99.2	81.8	8760	100.0
1998	8075.0	1067	87.2	83.3	87.2	83.2	86.4	82.2	7678	87.6
1999	8136.0	1067	87.8	83.7	87.8	83.6	87.0	82.6	7699	87.9
2000	6685.2	1067	72.0	82.8	72.0	82.7	71.3	81.7	6329	72.1
2001	9250.2	1067	99.9	84.0	99.7	83.9	99.0	82.9	8760	100.0
2002	5986.6	1067	64.7	82.7	64.7	82.6	64.0	81.7	5668	64.7
2003	0.0	1067	0.0	77.7	0.0	77.6	0.0	76.7	0	0.0
2004	1450.0	1067	15.5	74.1	15.5	74.0	15.5	73.2	1360	15.5
2005	5345.9	1067	57.2	73.2	57.2	73.1	57.2	72.3	5048	57.6
2006	5763.7	1067	62.0	72.6	62.0	72.6	61.7	71.8	5482	62.6
2007	6258.2	1067	67.1	72.4	67.1	72.3	67.0	71.6	5911	67.5
2008	7144.9	1067	76.7	72.6	76.7	72.5	76.2	71.8	6766	77.0
2009	6597.2	1067	70.9	72.5	70.9	72.4	70.6	71.7	6394	73.0
2010	7933.2	1067	85.4	73.0	85.3	73.0	84.9	72.3	7488	85.5

2011	1068.8	1067	17.2	70.8	11.7	70.5	11.4	69.8	1049	12.0
2012	0.0	1067	0.0	68.0	0.0	67.7	0.0	67.0	0	0.0
2013	0.0	1067	0.0	65.4	0.0	65.1	0.0	64.5	0	0.0
2014	0.0	1067	0.0	63.0	0.0	62.8	0.0	62.2	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					384	
C. Inspection, maintenance or repair combined with refuelling				1390		
D. Inspection, maintenance or repair without refuelling				71		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			894		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						18
Z. Other					202	
Subtotal	8760	0	0	2355	586	18
Total		8760			2959	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		46
12. Reactor I&C Systems		24
15. Reactor Cooling Systems		236
32. Feedwater and Main Steam System		69
33. Circulating Water System		1
42. Electrical Power Supply Systems		7
Total	0	383

**JP-12 GENKAI-1****Operator:** KYUSHU (Kyushu Electric Power Co.,Inc.)**Contractor:** MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 529.0 MW(e)

**Design Net Capacity:** 529.0 MW(e)

**Design Discharge Burnup:** 55000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 0.0 GW(e)·h

**Energy Availability Factor:** 0.0%

**Load Factor:** 0.0%

**Operating Factor:** 0.0%

**Energy Unavailability Factor:** 100.0%

**Total Off-line Time:** 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>PUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 15 Sep 1971      **Lifetime Generation:** 127667.0 GW(e)·h

**Date of First Criticality:** 28 Jan 1975      **Cumulative Energy Availability Factor:** 68.3%

**Date of Grid Connection:** 14 Feb 1975      **Cumulative Load Factor:** 69.0%

**Date of Commercial Operation:** 15 Oct 1975      **Cumulative Unit Capability Factor:** 68.3%

**Cumulative Energy Unavailability Factor:** 31.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	1041.2	529	89.2	89.2	89.2	89.2	89.1	89.1	2208	100.0
1976	3652.7	559	74.4	77.2	74.4	77.2	74.4	77.2	7022	79.9
1977	3785.0	532	83.4	79.9	83.4	79.9	81.2	79.0	7764	88.6
1978	3415.8	529	73.7	78.0	73.7	78.0	73.7	77.4	6681	76.3
1979	2219.8	531	47.7	71.0	47.7	71.0	47.7	70.5	4390	50.1
1980	3533.0	529	75.6	71.9	75.6	71.9	76.0	71.5	6772	77.1
1981	2739.8	529	58.9	69.8	58.9	69.8	59.1	69.6	5309	60.6
1982	3744.7	529	80.7	71.3	80.7	71.3	80.8	71.1	7072	80.7
1983	3960.5	529	85.4	73.0	85.4	73.0	85.5	72.8	7678	87.6
1984	3139.7	529	67.5	72.4	67.5	72.4	67.6	72.3	6072	69.1
1985	3089.7	529	66.7	71.8	66.7	71.8	66.7	71.7	6056	69.1
1986	2867.2	529	61.8	71.0	61.8	71.0	61.9	70.9	5425	61.9
1987	3762.7	529	81.3	71.8	81.1	71.8	81.2	71.7	7285	83.2
1988	2365.6	529	50.9	70.2	50.9	70.2	50.9	70.1	4743	54.0
1989	2183.2	529	47.1	68.6	47.1	68.6	47.1	68.5	4310	49.2
1990	2725.7	529	58.8	68.0	58.8	68.0	58.8	67.9	5159	58.9
1991	3357.5	529	72.7	68.3	72.4	68.2	72.5	68.2	6542	74.7
1992	3291.7	529	70.8	68.4	70.7	68.4	70.8	68.3	6397	72.8
1993	2797.4	529	60.3	68.0	60.3	67.9	60.4	67.9	5459	62.3
1994	2530.6	529	54.5	67.3	54.5	67.3	54.6	67.2	4787	54.6
1995	4151.0	529	89.4	68.4	89.4	68.3	89.6	68.3	7842	89.5
1996	4107.8	529	88.3	69.3	88.3	69.3	88.4	69.2	7829	89.1
1997	3653.4	529	78.7	69.7	78.7	69.7	78.8	69.7	6984	79.7
1998	3703.2	529	79.8	70.2	79.8	70.1	79.9	70.1	7057	80.6



1999	3305.9	529	71.2	70.2	71.2	70.2	71.3	70.2	6362	72.6
2000	4435.5	529	95.3	71.2	95.3	71.2	95.5	71.2	8400	95.6
2001	2512.3	529	54.1	70.5	54.1	70.5	54.2	70.5	4745	54.2
2002	3822.9	529	81.0	70.9	81.0	70.9	82.5	71.0	7097	81.0
2003	3622.8	529	76.4	71.1	76.4	71.1	78.2	71.2	6692	76.4
2004	4768.4	529	100.0	72.1	100.0	72.1	102.6	72.3	8784	100.0
2005	3310.8	529	69.7	72.0	69.7	72.0	71.4	72.3	6180	70.5
2006	3722.6	529	78.1	72.2	78.1	72.2	80.3	72.5	6891	78.7
2007	4299.3	529	89.8	72.8	89.8	72.8	92.8	73.1	7873	89.9
2008	4104.1	529	85.3	73.1	85.3	73.1	88.3	73.6	7545	85.9
2009	3817.4	529	79.1	73.3	79.1	73.3	82.4	73.9	6987	79.8
2010	3832.8	529	79.2	73.5	79.2	73.5	82.7	74.1	6988	79.8
2011	4425.4	529	91.6	74.0	91.6	74.0	95.5	74.7	8034	91.7
2012	0.0	529	0.0	72.0	0.0	72.0	0.0	72.7	0	0.0
2013	0.0	529	0.0	70.1	0.0	70.1	0.0	70.8	0	0.0
2014	0.0	529	0.0	68.3	0.0	68.3	0.0	69.0	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					120	
C. Inspection, maintenance or repair combined with refuelling				1912		
D. Inspection, maintenance or repair without refuelling				17		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			416		
Subtotal	8760	0	0	2345	120	0
Total	8760			2465		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		41
15. Reactor Cooling Systems		16
16. Steam generation systems		52
42. Electrical Power Supply Systems		1
Total	0	118

**JP-27 GENKAI-2****Operator:** KYUSHU (Kyushu Electric Power Co.,Inc.)**Contractor:** MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 529.0 MW(e)

**Design Net Capacity:** 529.0 MW(e)

**Design Discharge Burnup:** 55000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 0.0 GW(e)·h

**Energy Availability Factor:** 0.0%

**Load Factor:** 0.0%

**Operating Factor:** 0.0%

**Energy Unavailability Factor:** 100.0%

**Total Off-line Time:** 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>PUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 01 Feb 1977 **Lifetime Generation:** 118187.0 GW(e)·h

**Date of First Criticality:** 21 May 1980 **Cumulative Energy Availability Factor:** 71.8%

**Date of Grid Connection:** 03 Jun 1980 **Cumulative Load Factor:** 72.7%

**Date of Commercial Operation:** 30 Mar 1981 **Cumulative Unit Capability Factor:** 71.8%

**Cumulative Energy Unavailability Factor:** 28.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	3852.3	529	98.8	98.8	98.8	98.8	99.2	99.2	7310	99.5
1982	3598.1	529	77.4	87.2	77.4	87.2	77.6	87.5	6931	79.1
1983	3671.7	529	79.0	84.3	79.0	84.3	79.2	84.6	7056	80.5
1984	3803.5	529	81.6	83.6	81.6	83.6	81.9	83.9	7359	83.8
1985	3857.5	529	82.9	83.4	82.9	83.4	83.2	83.7	7423	84.7
1986	4631.7	529	99.5	86.2	99.5	86.2	99.9	86.5	8760	100.0
1987	3874.4	529	83.3	85.8	83.3	85.8	83.6	86.1	7426	84.8
1988	3458.4	529	74.2	84.3	74.2	84.3	74.4	84.6	6630	75.5
1989	3241.4	529	69.8	82.6	69.8	82.6	69.9	82.9	6230	71.1
1990	4654.8	529	100.0	84.4	100.0	84.4	100.4	84.7	8760	100.0
1991	3732.4	529	80.2	84.0	80.2	84.0	80.5	84.3	7141	81.5
1992	3480.6	529	74.5	83.2	74.5	83.2	74.9	83.5	6638	75.6
1993	3722.3	529	79.9	83.0	79.9	83.0	80.3	83.3	7007	80.0
1994	4013.5	529	86.2	83.2	86.2	83.2	86.6	83.5	7561	86.3
1995	3784.1	529	81.3	83.1	81.3	83.1	81.7	83.4	7225	82.5
1996	3644.7	529	78.1	82.7	78.1	82.7	78.4	83.1	6991	79.6
1997	3448.3	529	74.1	82.2	74.1	82.2	74.4	82.6	6541	74.7
1998	3701.4	529	79.6	82.1	79.6	82.1	79.9	82.4	6978	79.7
1999	4347.9	529	93.4	82.7	93.4	82.7	93.8	83.0	8186	93.4
2000	3473.3	529	74.4	82.3	74.4	82.3	74.7	82.6	6541	74.5
2001	2216.4	529	47.7	80.6	47.7	80.6	47.8	80.9	4177	47.7
2002	4107.5	529	86.7	80.9	86.7	80.9	88.6	81.3	7598	86.7
2003	4490.5	529	93.7	81.4	93.7	81.4	96.9	82.0	8209	93.7
2004	3848.6	529	80.2	81.4	80.2	81.4	82.8	82.0	7052	80.3

2005	3776.2	529	78.7	81.3	78.7	81.3	81.5	82.0	6952	79.4
2006	4166.5	529	86.8	81.5	86.8	81.5	89.9	82.3	7609	86.9
2007	3327.3	529	69.7	81.1	69.7	81.1	71.8	81.9	6153	70.2
2008	3340.5	529	69.6	80.6	69.6	80.6	71.9	81.5	6180	70.4
2009	3594.7	529	75.0	80.5	75.0	80.5	77.6	81.4	6628	75.7
2010	4791.9	529	100.0	81.1	100.0	81.1	103.4	82.1	8760	100.0
2011	378.0	529	7.8	78.7	7.8	78.7	8.2	79.7	690	7.9
2012	0.0	529	0.0	76.3	0.0	76.3	0.0	77.2	0	0.0
2013	0.0	529	0.0	73.9	0.0	73.9	0.0	74.9	0	0.0
2014	0.0	529	0.0	71.8	0.0	71.8	0.0	72.7	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					72	
C. Inspection, maintenance or repair combined with refuelling				1431		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			733		
Subtotal	8760	0	0	2164	72	0
Total	8760			2236		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		4
15. Reactor Cooling Systems		52
16. Steam generation systems		15
Total	0	71

# JP-45 GENKAI-3

Operator: KYUSHU (Kyushu Electric Power Co.,Inc.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1127.0 MW(e)  
 Design Net Capacity: 1127.0 MW(e)  
 Design Discharge Burnup: 43000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jun 1988      Lifetime Generation: 149375.0 GW(e)·h  
 Date of First Criticality: 28 May 1993      Cumulative Energy Availability Factor: 68.8%  
 Date of Grid Connection: 15 Jun 1993      Cumulative Load Factor: 69.8%  
 Date of Commercial Operation: 18 Mar 1994      Cumulative Unit Capability Factor: 68.8%  
    Cumulative Energy Unavailability Factor: 31.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1994	8086.5	1127	97.2	97.2	97.2	97.2	97.7	97.7	7146	97.3
1995	7356.3	1127	74.1	84.7	74.1	84.7	74.5	85.1	6588	75.2
1996	7444.9	1127	74.9	81.2	74.9	81.2	75.2	81.6	6663	75.9
1997	8259.9	1127	83.3	81.8	83.3	81.8	83.7	82.1	7358	84.0
1998	9633.1	1127	97.1	84.9	97.1	84.9	97.6	85.3	8514	97.2
1999	7999.8	1127	80.7	84.2	80.7	84.2	81.0	84.6	7068	80.7
2000	8109.7	1127	81.6	83.8	81.6	83.8	81.9	84.2	7164	81.6
2001	8205.1	1127	82.7	83.7	82.7	83.7	83.1	84.1	7249	82.8
2002	9561.5	1127	96.4	85.1	96.4	85.1	96.9	85.5	8446	96.4
2003	8667.8	1127	85.6	85.2	85.6	85.2	87.8	85.7	7497	85.6
2004	8121.1	1127	79.9	84.7	79.9	84.7	82.0	85.4	7015	79.9
2005	8658.9	1127	85.3	84.7	85.3	84.7	87.7	85.6	7523	85.9
2006	9725.2	1127	95.9	85.6	95.9	85.6	98.5	86.6	8401	95.9
2007	7988.3	1127	79.1	85.1	79.1	85.1	80.9	86.2	6987	79.8
2008	8259.6	1127	81.6	84.9	81.6	84.9	83.4	86.0	7211	82.1
2009	8061.9	1127	79.9	84.6	79.9	84.6	81.7	85.7	7043	80.4
2010	9506.5	1127	94.2	85.1	94.2	85.1	96.3	86.4	8257	94.3
2011	0.0	1127	0.0	80.4	0.0	80.4	0.0	81.5	0	0.0
2012	0.0	1127	0.0	76.1	0.0	76.1	0.0	77.2	0	0.0
2013	0.0	1127	0.0	72.3	0.0	72.3	0.0	73.3	0	0.0
2014	0.0	1127	0.0	68.8	0.0	68.8	0.0	69.8	0	0.0

## 6. Full Outages, Analysis by Cause

	2014 Hours Lost	1994 to 2014
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Outage Cause	2014 Hours Lost			Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling				1139		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			1141		
Subtotal	8760	0	0	2280	0	0
Total	8760			2280		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1994 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

## JP-46 GENKAI-4

Operator: KYUSHU (Kyushu Electric Power Co.,Inc.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1127.0 MW(e)  
 Design Net Capacity: 1127.0 MW(e)  
 Design Discharge Burnup: 44000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 15 Jul 1992      Lifetime Generation: 125869.0 GW(e)·h  
 Date of First Criticality: 23 Oct 1996      Cumulative Energy Availability Factor: 71.1%  
 Date of Grid Connection: 12 Nov 1996      Cumulative Load Factor: 71.9%  
 Date of Commercial Operation: 25 Jul 1997      Cumulative Unit Capability Factor: 71.1%  
    Cumulative Energy Unavailability Factor: 28.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1997	4792.1	1127	100.0	100.0	100.0	100.0	96.3	96.3	4259	96.4
1998	7634.5	1127	76.7	84.5	76.7	84.5	77.3	83.7	6783	77.4
1999	9716.3	1127	97.7	89.8	97.7	89.8	98.4	89.6	8559	97.7
2000	8181.2	1127	82.0	87.6	82.0	87.6	82.6	87.6	7205	82.0
2001	8107.2	1127	81.5	86.2	81.5	86.2	82.1	86.4	7142	81.5
2002	8208.3	1127	82.4	85.5	82.4	85.5	83.1	85.8	7217	82.4
2003	9678.7	1127	96.1	87.2	96.1	87.2	98.0	87.7	8422	96.1
2004	8330.6	1127	82.4	86.5	82.4	86.5	84.2	87.2	7243	82.5
2005	8572.5	1127	85.0	86.3	85.0	86.3	86.8	87.2	7499	85.6
2006	7765.6	1127	77.0	85.4	77.0	85.4	78.7	86.3	6813	77.8
2007	10025.3	1127	100.0	86.8	100.0	86.8	101.5	87.7	8760	100.0
2008	7696.0	1127	76.6	85.9	76.6	85.9	77.7	86.8	6797	77.4
2009	8325.6	1127	83.1	85.6	83.1	85.6	84.3	86.6	7331	83.7
2010	8365.6	1127	83.4	85.5	83.4	85.5	84.7	86.5	7355	84.0
2011	8999.4	1127	90.1	85.8	90.1	85.8	91.2	86.8	7918	90.4
2012	0.0	1127	0.0	80.3	0.0	80.3	0.0	81.2	0	0.0
2013	0.0	1127	0.0	75.4	0.0	75.4	0.0	76.3	0	0.0
2014	0.0	1127	0.0	71.1	0.0	71.1	0.0	71.9	0	0.0

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1998 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					79	

C. Inspection, maintenance or repair combined with refuelling				1119		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			878		
Subtotal	8760	0	0	1997	79	0
Total	8760			2076		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1998 to 2014 Average Hours Lost Per Year
15. Reactor Cooling Systems		13
31. Turbine and auxiliaries		41
41. Main Generator Systems		25
Total	0	79

# JP-36 HAMAOKA-3

**Operator:** CHUBU (CHUBU ELECTRIC POWER CO.,INC)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1056.0 MW(e)  
**Design Net Capacity:** 1056.0 MW(e)  
**Design Discharge Burnup:** 29500 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 18 Apr 1983  
**Date of First Criticality:** 21 Nov 1986  
**Date of Grid Connection:** 20 Jan 1987  
**Date of Commercial Operation:** 28 Aug 1987

**Lifetime Generation:** 171104.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 66.8%  
**Cumulative Load Factor:** 66.3%  
**Cumulative Unit Capability Factor:** 67.0%  
**Cumulative Energy Unavailability Factor:** 33.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	3622.6	1066	99.5	99.5	99.5	99.5	92.5	92.5	3470	94.5
1988	7066.8	1066	75.8	82.8	75.8	82.8	75.5	80.5	6862	78.1
1989	8542.0	1066	92.4	86.7	92.4	86.7	91.5	85.0	8167	93.2
1990	6601.3	1056	71.4	82.3	71.4	82.3	71.4	81.1	6366	72.7
1991	6763.1	1056	73.5	80.3	73.5	80.3	73.1	79.3	6472	73.9
1992	6585.4	1056	71.7	78.7	71.4	78.7	71.0	77.8	6371	72.5
1993	8768.0	1056	95.3	81.3	95.3	81.2	94.8	80.4	8359	95.4
1994	6490.5	1056	77.4	80.8	77.4	80.7	70.2	79.0	6784	77.4
1995	7725.7	1056	84.6	81.2	84.1	81.1	83.5	79.6	7429	84.8
1996	6891.6	1056	74.8	80.6	74.7	80.4	74.3	79.0	6573	74.8
1997	8109.7	1056	88.3	81.3	88.3	81.2	87.7	79.8	7863	89.8
1998	9200.7	1056	100.0	82.9	100.0	82.8	99.5	81.5	8760	100.0
1999	7618.3	1056	82.8	82.9	82.8	82.8	82.4	81.6	7255	82.8
2000	7706.0	1056	83.6	83.0	83.6	82.9	83.1	81.7	7340	83.6
2001	6476.8	1056	70.4	82.1	70.4	82.0	70.0	80.9	6171	70.4
2002	6350.9	1056	69.0	81.3	69.0	81.2	68.7	80.1	6044	69.0
2003	1486.6	1056	16.1	77.3	16.1	77.2	16.1	76.2	1403	16.0
2004	9342.5	1056	100.0	78.6	100.0	78.5	100.7	77.6	8784	100.0
2005	5793.4	1056	62.2	77.7	62.1	77.7	62.6	76.8	5473	62.5
2006	6396.9	1056	69.2	77.3	68.7	77.2	69.2	76.4	6081	69.4
2007	9196.5	1056	100.0	78.4	99.2	78.3	99.4	77.5	8760	100.0
2008	6882.9	1056	74.8	78.2	74.0	78.1	74.2	77.4	6625	75.4
2009	6437.1	1056	69.2	77.8	69.2	77.7	69.6	77.0	6085	69.5
2010	8434.8	1056	91.0	78.4	91.0	78.2	91.2	77.6	7974	91.0



2011	0.0	1056	0.0	75.2	0.0	75.0	0.0	74.5	0	0.0
2012	0.0	1056	0.0	72.2	0.0	72.1	0.0	71.5	0	0.0
2013	0.0	1056	0.0	69.5	0.0	69.4	0.0	68.8	0	0.0
2014	0.0	1056	0.0	67.0	0.0	66.8	0.0	66.3	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					163	
C. Inspection, maintenance or repair combined with refuelling				1291		
D. Inspection, maintenance or repair without refuelling				25	4	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			626		
H. Nuclear regulatory requirements					222	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					35	
Z. Other					130	
Subtotal	8760	0	0	1942	554	0
Total	8760			2496		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		139
31. Turbine and auxiliaries		3
35. All other I&C Systems		0
XX. Miscellaneous Systems		21
Total	0	163

## JP-49 HAMAOKA-4

Operator: CHUBU (CHUBU ELECTRIC POWER CO.,INC)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1092.0 MW(e)

Design Net Capacity: 1092.0 MW(e)

Design Discharge Burnup: 39500 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 13 Oct 1989      Lifetime Generation: 130349.0 GW(e)·h

Date of First Criticality: 02 Dec 1992      Cumulative Energy Availability Factor: 66.2%

Date of Grid Connection: 27 Jan 1993      Cumulative Load Factor: 66.2%

Date of Commercial Operation: 03 Sep 1993      Cumulative Unit Capability Factor: 66.7%

   Cumulative Energy Unavailability Factor: 33.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1993	3186.2	1092	99.9	99.9	99.9	99.9	99.7	99.7	2928	100.0
1994	7110.4	1092	74.9	81.2	74.7	81.0	74.3	80.7	6576	75.1
1995	9546.0	1092	100.0	89.2	100.0	89.1	99.8	88.9	8760	100.0
1996	8301.3	1092	86.7	88.5	86.7	88.4	86.5	88.2	7615	86.7
1997	7883.0	1092	83.1	87.2	82.6	87.1	82.4	86.8	7302	83.4
1998	7154.1	1092	74.9	84.9	74.9	84.8	74.8	84.6	6604	75.4
1999	9545.1	1092	99.9	87.3	99.9	87.2	99.8	87.0	8760	100.0
2000	8233.7	1092	86.3	87.2	86.0	87.0	85.8	86.8	7577	86.3
2001	8773.5	1092	91.8	87.7	91.8	87.6	91.7	87.4	8046	91.8
2002	6436.4	1092	67.4	85.5	67.4	85.4	67.3	85.3	5906	67.4
2003	3729.8	1092	39.1	81.1	39.1	81.0	39.0	80.8	3415	39.0
2004	7279.7	1092	75.8	80.6	75.8	80.5	75.9	80.3	6668	75.9
2005	9595.6	1092	100.0	82.2	100.0	82.1	100.3	82.0	8760	100.0
2006	6523.5	1092	68.2	81.1	68.2	81.0	68.2	80.9	6423	73.3
2007	7720.9	1092	80.6	81.1	80.5	81.0	80.7	80.9	7098	81.0
2008	9293.6	1092	96.5	82.1	96.5	82.0	96.9	82.0	8512	96.9
2009	4847.5	1092	60.9	80.8	50.5	80.1	50.7	80.0	4480	51.1
2010	7513.0	1092	78.4	80.7	78.3	80.0	78.5	80.0	6870	78.4
2011	2486.9	1092	26.0	77.7	26.0	77.0	26.0	77.0	2297	26.2
2012	0.0	1092	0.0	73.6	0.0	73.0	0.0	73.0	0	0.0
2013	0.0	1092	0.0	70.0	0.0	69.5	0.0	69.4	0	0.0
2014	0.0	1092	0.0	66.7	0.0	66.2	0.0	66.2	0	0.0

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1994 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					365	
C. Inspection, maintenance or repair combined with refuelling				968		
D. Inspection, maintenance or repair without refuelling				28		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			1101		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						42
Z. Other					50	
Subtotal	8760	0	0	2097	415	42
Total	8760			2554		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1994 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		249
13. Reactor Auxiliary Systems		18
31. Turbine and auxiliaries		84
32. Feedwater and Main Steam System		12
Total	0	363

# JP-60 HAMAOKA-5

Operator: CHUBU (CHUBU ELECTRIC POWER CO.,INC)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP)  
at the beginning of 2014: 1325.0 MW(e)

Design Net Capacity: 1325.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUf (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 12 Jul 2000      Lifetime Generation: 38950.0 GW(e)·h

Date of First Criticality: 23 Mar 2004      Cumulative Energy Availability Factor: 30.5%

Date of Grid Connection: 30 Apr 2004      Cumulative Load Factor: 31.3%

Date of Commercial Operation: 18 Jan 2005      Cumulative Unit Capability Factor: 36.2%

   Cumulative Energy Unavailability Factor: 69.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2005	11870.4	1325	100.0	100.0	100.0	100.0	102.3	102.3	8760	100.0
2006	3385.2	1325	28.5	64.3	28.5	64.3	29.2	65.7	2515	28.7
2007	7652.7	1212	68.8	65.7	68.6	65.6	71.0	67.4	6159	70.3
2008	7516.3	1212	68.8	66.4	68.3	66.3	70.6	68.2	6075	69.2
2009	1338.3	1212	51.3	63.5	12.2	55.9	12.6	57.5	1076	12.3
2010	0.0	1212	20.0	56.5	0.0	46.9	0.0	48.2	0	0.0
2011	3353.4	1325	29.1	52.4	29.1	44.2	29.1	45.4	2557	29.2
2012	0.0	1325	0.0	45.6	0.0	38.5	0.0	39.4	0	0.0
2013	0.0	1325	0.0	40.3	0.0	34.0	0.0	34.9	0	0.0
2014	0.0	1325	0.0	36.2	0.0	30.5	0.0	31.3	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2006 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					1272	
C. Inspection, maintenance or repair combined with refuelling				488		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				243		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			2566		
H. Nuclear regulatory requirements					608	
N. Environmental conditions (lack of						575

cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						
Subtotal	8760	0	0	3297	1880	575
Total	8760			5752		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2006 to 2014 Average Hours Lost Per Year
31. Turbine and auxiliaries		1272
Total	0	1272

# JP-58 HIGASHI DORI-1 (TOHOKU)

**Operator:** TOHOKU (Tohoku Electric Power Co., Inc)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

IMPLEMENTATION OF SAFETY MEASURES FOR CONSIDERING THE NEW REGULATORY REQUIREMENTS.

## 5. Historical Summary

**Date of Construction Start:** 07 Nov 2000 **Lifetime Generation:** 41897.0 GW(e)·h  
**Date of First Criticality:** 24 Jan 2005 **Cumulative Energy Availability Factor:** 47.1%  
**Date of Grid Connection:** 09 Mar 2005 **Cumulative Load Factor:** 46.6%  
**Date of Commercial Operation:** 08 Dec 2005 **Cumulative Unit Capability Factor:** 47.1%  
**Cumulative Energy Unavailability Factor:** 52.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2005	610.5	1067	100.0	100.0	100.0	100.0	76.9	76.9	576	77.4
2006	9269.3	1067	100.0	100.0	99.7	99.8	99.2	97.4	8760	100.0
2007	6150.8	1067	66.2	83.8	66.2	83.7	65.8	82.3	5827	66.5
2008	6274.8	1067	67.3	78.4	67.3	78.3	66.9	77.3	5947	67.7
2009	7064.5	1067	76.1	77.9	76.0	77.8	75.6	76.9	6696	76.4
2010	9299.0	1067	100.0	82.2	100.0	82.1	99.5	81.3	8760	100.0
2011	911.0	1067	9.8	70.3	9.8	70.3	9.7	69.6	865	9.9
2012	0.0	1067	0.0	60.4	0.0	60.3	0.0	59.7	0	0.0
2013	0.0	1067	0.0	52.9	0.0	52.9	0.0	52.3	0	0.0
2014	0.0	1067	0.0	47.1	0.0	47.1	0.0	46.6	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2006 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling				1082	87	
D. Inspection, maintenance or repair without refuelling				165		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			2365		
Subtotal	8760	0	0	3612	87	0
Total	8760			3699		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2006 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

## JP-23 IKATA-1

Operator: SHIKOKU (SHIKOKU ELECTRIC POWER CO.,INC)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 538.0 MW(e)

Design Net Capacity: 538.0 MW(e)

Design Discharge Burnup: 51000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA DAI-ICHI AND DAI-NI NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 01 Sep 1973      Lifetime Generation: 125680.0 GW(e)·h

Date of First Criticality: 29 Jan 1977      Cumulative Energy Availability Factor: 71.4%

Date of Grid Connection: 17 Feb 1977      Cumulative Load Factor: 71.4%

Date of Commercial Operation: 30 Sep 1977      Cumulative Unit Capability Factor: 71.4%

   Cumulative Energy Unavailability Factor: 28.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	1299.7	538	82.5	82.5	82.5	82.5	82.5	82.5	2680	91.5
1978	3138.0	538	66.6	70.6	66.6	70.6	66.6	70.6	6272	71.6
1979	2564.5	538	54.4	63.7	54.4	63.7	54.4	63.7	4984	56.9
1980	3127.4	538	66.2	64.4	66.2	64.4	66.2	64.4	6006	68.4
1981	3236.8	538	68.7	65.4	68.7	65.4	68.7	65.4	6253	71.4
1982	3527.3	538	74.8	67.2	74.8	67.2	74.8	67.2	6662	76.1
1983	4667.6	538	99.0	72.2	99.0	72.2	99.0	72.2	8754	99.9
1984	3318.2	538	70.5	72.0	70.5	72.0	70.2	71.9	6283	71.5
1985	3674.1	538	78.2	72.7	78.2	72.7	78.0	72.6	6962	79.5
1986	3719.6	538	79.2	73.4	79.2	73.4	78.9	73.3	7044	80.4
1987	4696.0	538	100.0	76.0	100.0	76.0	99.6	75.9	8760	100.0
1988	3533.9	538	75.0	75.9	75.0	75.9	74.8	75.8	6719	76.5
1989	3563.6	538	76.2	75.9	76.2	75.9	75.6	75.8	6791	77.5
1990	3632.2	538	76.4	75.9	76.4	75.9	77.1	75.9	6932	79.1
1991	4382.4	538	93.4	77.2	93.4	77.2	93.0	77.0	8184	93.4
1992	3675.4	538	78.5	77.3	78.5	77.3	77.8	77.1	6995	79.6
1993	3494.2	538	74.4	77.1	74.4	77.1	74.1	76.9	6630	75.7
1994	3601.3	538	76.6	77.0	76.6	77.0	76.4	76.9	6717	76.7
1995	3598.7	538	76.5	77.0	76.5	77.0	76.4	76.9	6815	77.8
1996	3579.1	538	75.9	77.0	75.9	77.0	75.7	76.8	6768	77.0
1997	4688.9	538	99.7	78.1	99.7	78.1	99.5	77.9	8760	100.0
1998	3239.2	538	68.9	77.7	68.9	77.7	68.7	77.5	6127	69.9



1999	3783.2	538	80.4	77.8	80.4	77.8	80.3	77.6	7051	80.5
2000	3194.1	538	67.7	77.3	67.7	77.3	67.6	77.2	5953	67.8
2001	4477.6	538	95.2	78.1	95.2	78.1	95.0	77.9	8412	96.0
2002	3527.9	538	74.2	77.9	74.2	77.9	74.9	77.8	6505	74.3
2003	3734.6	538	77.8	77.9	77.8	77.9	79.2	77.8	6819	77.8
2004	3249.6	538	67.6	77.5	67.6	77.5	68.8	77.5	5949	67.7
2005	4267.9	538	90.3	78.0	90.1	78.0	90.6	78.0	7949	90.7
2006	3461.2	538	73.2	77.8	73.2	77.8	73.4	77.8	6465	73.8
2007	3919.4	538	82.6	78.0	82.5	78.0	83.2	78.0	7259	82.9
2008	3980.2	538	84.0	78.2	83.7	78.2	84.2	78.2	7403	84.3
2009	3081.7	538	65.2	77.8	65.1	77.8	65.4	77.8	5731	65.4
2010	3953.0	538	83.4	77.9	83.3	77.9	83.9	78.0	7329	83.7
2011	3199.7	538	67.3	77.6	67.3	77.6	67.9	77.7	5904	67.4
2012	0.0	538	0.1	75.4	0.1	75.4	0.0	75.5	0	0.0
2013	0.0	538	0.0	73.4	0.0	73.3	0.0	73.4	0	0.0
2014	0.0	538	0.0	71.4	0.0	71.4	0.0	71.4	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1978 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					46	
C. Inspection, maintenance or repair combined with refuelling				1627		
D. Inspection, maintenance or repair without refuelling				11		
E. Testing of plant systems or components					0	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			503		
J. Grid limitation, failure or grid unavailability						0
Z. Other					12	
Subtotal	8760	0	0	2141	58	0
Total	8760			2199		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1978 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		16
14. Safety Systems		0
31. Turbine and auxiliaries		25
42. Electrical Power Supply Systems		0
Total	0	45

**JP-32 IKATA-2**

Operator: SHIKOKU (SHIKOKU ELECTRIC POWER CO.,INC)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

**1. Station Details**

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 538.0 MW(e)

Design Net Capacity: 538.0 MW(e)

Design Discharge Burnup: 51000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA DAI-ICHI AND DAI-NI NUCLEAR POWER STATIONS.

**5. Historical Summary**

Date of Construction Start: 01 Aug 1978      Lifetime Generation: 115874.0 GW(e)·h

Date of First Criticality: 31 Jul 1981      Cumulative Energy Availability Factor: 74.9%

Date of Grid Connection: 19 Aug 1981      Cumulative Load Factor: 74.9%

Date of Commercial Operation: 19 Mar 1982      Cumulative Unit Capability Factor: 74.9%

Cumulative Energy Unavailability Factor: 25.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1982	3893.9	538	98.6	98.6	98.6	98.6	98.6	98.6	7327	99.8
1983	3575.0	538	75.9	86.2	75.9	86.2	75.9	86.2	6798	77.6
1984	3776.6	538	80.3	84.1	80.1	84.1	79.9	84.0	7157	81.5
1985	3694.1	538	78.6	82.7	78.6	82.6	78.4	82.5	6995	79.9
1986	4698.6	538	100.0	86.3	100.0	86.2	99.7	86.1	8760	100.0
1987	3758.7	538	80.5	85.3	80.5	85.3	79.8	85.0	7137	81.5
1988	3541.5	538	75.1	83.8	75.1	83.8	74.9	83.5	6743	76.8
1989	3751.3	538	79.8	83.3	79.8	83.3	79.6	83.0	7128	81.4
1990	4694.9	538	99.9	85.2	99.9	85.2	99.6	84.9	8760	100.0
1991	3526.2	538	75.2	84.2	75.2	84.1	74.8	83.9	6731	76.8
1992	3479.9	538	74.3	83.3	74.3	83.2	73.6	82.9	6639	75.6
1993	3588.6	538	76.4	82.7	76.4	82.7	76.1	82.4	6799	77.6
1994	4700.6	538	99.9	84.0	99.9	84.0	99.7	83.7	8760	100.0
1995	3720.9	538	79.0	83.7	79.0	83.6	79.0	83.4	7014	80.1
1996	3664.8	538	77.7	83.3	77.7	83.2	77.5	83.0	6935	79.0
1997	3610.4	538	76.8	82.8	76.8	82.8	76.6	82.6	6831	78.0
1998	4701.1	538	99.9	83.9	99.9	83.8	99.7	83.6	8760	100.0
1999	3734.4	538	79.5	83.6	79.5	83.6	79.2	83.3	6973	79.6
2000	3695.0	538	78.3	83.3	78.3	83.3	78.2	83.1	6888	78.4
2001	3145.7	538	66.9	82.5	66.9	82.5	66.7	82.2	5875	67.1
2002	4718.5	538	99.2	83.3	99.2	83.3	100.1	83.1	8698	99.3
2003	3904.7	538	81.6	83.2	81.6	83.2	82.9	83.1	7150	81.6

2004	3611.9	538	76.1	82.9	75.8	82.9	76.4	82.8	6683	76.1
2005	3163.3	538	67.1	82.3	67.0	82.2	67.1	82.1	5890	67.2
2006	3329.2	538	70.4	81.8	70.3	81.8	70.6	81.7	6230	71.1
2007	4720.6	538	100.0	82.5	99.8	82.4	100.2	82.4	8760	100.0
2008	3897.6	538	82.6	82.5	82.3	82.4	82.5	82.4	7285	82.9
2009	3101.7	538	65.6	81.9	65.6	81.8	65.8	81.8	5778	66.0
2010	3717.8	538	78.0	81.7	78.0	81.7	78.9	81.7	6862	78.3
2011	4752.9	538	100.0	82.4	100.0	82.3	100.8	82.3	8760	100.0
2012	168.9	538	3.6	79.8	3.6	79.8	3.6	79.8	312	3.6
2013	0.0	538	0.0	77.3	0.0	77.3	0.0	77.3	0	0.0
2014	0.0	538	0.0	74.9	0.0	74.9	0.0	74.9	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					7	
C. Inspection, maintenance or repair combined with refuelling				1349		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				256		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			270		
J. Grid limitation, failure or grid unavailability						0
Subtotal	8760	0	0	1875	7	0
Total	8760			1882		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		0
31. Turbine and auxiliaries		6
Total	0	6

**JP-47 IKATA-3**

Operator: SHIKOKU (SHIKOKU ELECTRIC POWER CO.,INC)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

**1. Station Details**

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 846.0 MW(e)

Design Net Capacity: 846.0 MW(e)

Design Discharge Burnup: 49000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA DAI-ICHI AND DAI-NI NUCLEAR POWER STATIONS.

**5. Historical Summary**

Date of Construction Start: 01 Oct 1990      Lifetime Generation: 108079.0 GW(e)·h

Date of First Criticality: 23 Feb 1994      Cumulative Energy Availability Factor: 70.7%

Date of Grid Connection: 29 Mar 1994      Cumulative Load Factor: 72.8%

Date of Commercial Operation: 15 Dec 1994      Cumulative Unit Capability Factor: 70.7%

   Cumulative Energy Unavailability Factor: 29.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1994	636.8	846	100.0	100.0	100.0	100.0	101.2	101.2	744	100.0
1995	7491.8	846	100.0	100.0	100.0	100.0	101.1	101.1	8760	100.0
1996	5578.2	846	74.2	87.6	74.2	87.6	75.1	88.6	6621	75.4
1997	6134.7	846	81.9	85.8	81.9	85.8	82.8	86.7	7242	82.7
1998	6250.4	846	83.4	85.2	83.4	85.2	84.3	86.1	7374	84.2
1999	6298.4	846	84.1	85.0	84.1	85.0	85.0	85.9	7368	84.1
2000	6660.3	846	88.7	85.6	88.7	85.6	89.6	86.5	7790	88.7
2001	6210.7	846	82.9	85.2	82.9	85.2	83.8	86.1	7267	83.0
2002	6599.5	846	85.8	85.3	85.8	85.3	89.1	86.5	7518	85.8
2003	5862.1	846	74.9	84.1	74.9	84.1	79.1	85.7	6560	74.9
2004	7828.9	846	100.0	85.7	100.0	85.7	105.4	87.6	8784	100.0
2005	6699.4	846	86.8	85.8	86.8	85.8	90.4	87.9	7637	87.2
2006	6134.6	846	79.5	85.3	79.5	85.3	82.8	87.5	6990	79.8
2007	6869.3	846	88.9	85.6	88.9	85.6	92.7	87.9	7813	89.2
2008	6393.0	846	82.6	85.4	82.6	85.4	86.0	87.7	7282	82.9
2009	7716.6	846	100.0	86.3	100.0	86.3	104.1	88.8	8760	100.0
2010	6490.7	846	84.3	86.2	84.3	86.2	87.6	88.7	7410	84.6
2011	2511.0	846	32.6	83.1	32.6	83.1	33.9	85.5	2852	32.6
2012	0.0	846	0.1	78.5	0.1	78.5	0.0	80.8	0	0.0
2013	0.0	846	0.0	74.4	0.0	74.4	0.0	76.6	0	0.0
2014	0.0	846	0.0	70.7	0.0	70.7	0.0	72.8	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1996 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					62	
C. Inspection, maintenance or repair combined with refuelling				1011		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			1160		
Z. Other					7	
Subtotal	8760	0	0	2171	69	0
Total	8760			2240		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1996 to 2014 Average Hours Lost Per Year
41. Main Generator Systems		12
42. Electrical Power Supply Systems		49
Total	0	61

# JP-33 KASHIWAZAKI KARIWA-1

**Operator:** TEPCO (Tokyo Electric Power Company)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA  
 DAI-ICHI NUCLEAR POWER STATIONS.

## 5. Historical Summary

**Date of Construction Start:** 05 Jun 1980 **Lifetime Generation:** 160133.0 GW(e)·h  
**Date of First Criticality:** 12 Dec 1984 **Cumulative Energy Availability Factor:** 58.3%  
**Date of Grid Connection:** 13 Feb 1985 **Cumulative Load Factor:** 57.6%  
**Date of Commercial Operation:** 18 Sep 1985 **Cumulative Unit Capability Factor:** 59.3%  
**Cumulative Energy Unavailability Factor:** 41.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	2939.8	1067	100.0	100.0	100.0	100.0	94.1	94.1	2808	95.9
1986	6703.7	1067	73.0	79.8	73.0	79.8	71.7	77.3	6463	73.8
1987	9195.5	1067	100.0	88.4	100.0	88.4	98.4	86.3	8760	100.0
1988	6959.7	1067	75.0	84.4	75.0	84.4	74.3	82.7	6660	75.8
1989	6442.3	1067	69.7	81.0	69.7	81.0	68.9	79.5	6236	71.2
1990	5987.4	1067	65.0	78.0	65.0	78.0	64.1	76.6	5711	65.2
1991	9031.6	1067	97.9	81.1	97.9	81.1	96.6	79.8	8618	98.4
1992	6958.1	1067	75.8	80.4	75.4	80.4	74.2	79.0	6728	76.6
1993	6874.3	1067	74.7	79.7	74.7	79.7	73.5	78.4	6575	75.1
1994	7020.2	1067	76.1	79.3	76.1	79.3	75.1	78.0	6744	77.0
1995	9235.2	1067	100.0	81.3	100.0	81.3	98.8	80.0	8760	100.0
1996	6814.4	1067	73.6	80.7	73.6	80.6	72.7	79.4	6469	73.6
1997	7899.9	1067	85.7	81.1	85.7	81.0	84.5	79.8	7525	85.9
1998	6176.2	1067	67.4	80.0	67.4	80.0	66.1	78.8	5960	68.0
1999	9198.8	1067	99.7	81.4	99.7	81.4	98.4	80.1	8760	100.0
2000	7714.7	1067	83.6	81.6	83.6	81.5	82.3	80.3	7346	83.6
2001	7070.5	1067	76.9	81.3	76.9	81.2	75.6	80.0	6743	77.0
2002	5906.2	1067	64.2	80.3	64.2	80.3	63.2	79.0	5628	64.2
2003	0.0	1067	0.0	75.9	0.0	75.9	0.0	74.7	0	0.0
2004	6496.7	1067	69.2	75.6	69.2	75.5	69.3	74.4	6171	70.3
2005	3125.9	1067	33.5	73.5	33.5	73.5	33.4	72.4	3051	34.8
2006	6299.4	1067	67.1	73.2	67.1	73.2	67.4	72.2	5899	67.3

2007	3165.8	1067	62.1	72.7	33.6	71.4	33.9	70.5	2952	33.7
2008	0.0	1067	0.0	69.6	0.0	68.3	0.0	67.5	0	0.0
2009	0.0	1067	0.0	66.7	0.0	65.5	0.0	64.7	0	0.0
2010	5290.8	1067	56.3	66.3	56.3	65.2	56.6	64.4	5022	57.3
2011	5605.5	1067	59.4	66.1	59.4	65.0	60.0	64.2	5208	59.5
2012	0.0	1067	0.0	63.6	0.0	62.6	0.0	61.8	0	0.0
2013	0.0	1067	0.0	61.4	0.0	60.4	0.0	59.7	0	0.0
2014	0.0	1067	0.0	59.3	0.0	58.3	0.0	57.6	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					310	
C. Inspection, maintenance or repair combined with refuelling				1466		
D. Inspection, maintenance or repair without refuelling				29		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			1413		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						86
Z. Other					62	
Subtotal	8760	0	0	2908	372	86
Total	8760			3366		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		75
12. Reactor I&C Systems		157
15. Reactor Cooling Systems		37
32. Feedwater and Main Steam System		32
41. Main Generator Systems		7
Total	0	308

## JP-39 KASHIWAZAKI KARIWA-2

Operator: TEPCO (Tokyo Electric Power Company)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1067.0 MW(e)

Design Net Capacity: 1067.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA DAI-ICHI NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 18 Nov 1985      Lifetime Generation: 120879.0 GW(e)·h

Date of First Criticality: 30 Nov 1989      Cumulative Energy Availability Factor: 52.1%

Date of Grid Connection: 08 Feb 1990      Cumulative Load Factor: 51.4%

Date of Commercial Operation: 28 Sep 1990      Cumulative Unit Capability Factor: 52.1%

   Cumulative Energy Unavailability Factor: 47.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1990	2935.8	1067	100.0	100.0	100.0	100.0	94.0	94.0	2813	96.1
1991	6642.4	1067	72.4	79.3	72.4	79.3	71.1	76.8	6440	73.5
1992	9046.9	1067	97.9	87.3	97.9	87.3	96.5	85.3	8623	98.2
1993	7212.6	1067	78.5	84.7	78.3	84.6	77.2	82.8	6911	78.9
1994	7291.1	1067	79.0	83.4	79.0	83.3	78.0	81.7	6962	79.5
1995	7696.8	1067	83.4	83.4	83.4	83.3	82.3	81.8	7329	83.7
1996	8811.1	1067	95.3	85.3	95.2	85.2	94.0	83.8	8396	95.6
1997	7284.4	1067	79.1	84.4	79.1	84.4	77.9	83.0	6913	78.9
1998	8142.1	1067	88.4	84.9	88.4	84.9	87.1	83.5	7769	88.7
1999	8208.8	1067	89.2	85.4	89.1	85.3	87.8	83.9	7814	89.2
2000	8140.0	1067	88.3	85.6	88.3	85.6	86.8	84.2	7760	88.3
2001	7595.5	1067	82.4	85.4	82.4	85.3	81.3	84.0	7223	82.5
2002	5866.2	1067	63.1	83.6	63.1	83.5	62.8	82.2	5532	63.2
2003	0.0	1067	0.0	77.3	0.0	77.3	0.0	76.1	0	0.0
2004	4660.3	1067	49.6	75.4	49.6	75.3	49.7	74.2	4361	49.6
2005	6388.4	1067	68.4	74.9	68.4	74.9	68.3	73.8	6035	68.9
2006	9330.8	1067	99.8	76.4	99.8	76.4	99.8	75.4	8760	100.0
2007	1830.3	1067	19.8	73.2	19.8	73.1	19.6	72.2	1786	20.4
2008	0.0	1067	0.0	69.2	0.0	69.1	0.0	68.3	0	0.0
2009	0.0	1067	0.0	65.6	0.0	65.6	0.0	64.7	0	0.0
2010	0.0	1067	0.0	62.4	0.0	62.4	0.0	61.6	0	0.0
2011	0.0	1067	0.0	59.4	0.0	59.4	0.0	58.7	0	0.0



2012	0.0	1067	0.0	56.8	0.0	56.8	0.0	56.0	0	0.0
2013	0.0	1067	0.0	54.3	0.0	54.3	0.0	53.6	0	0.0
2014	0.0	1067	0.0	52.1	0.0	52.1	0.0	51.4	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1991 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					454	
C. Inspection, maintenance or repair combined with refuelling				1170		
D. Inspection, maintenance or repair without refuelling				10		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			2192		
L. Human factor related					7	
Z. Other					52	
Subtotal	8760	0	0	3372	513	0
Total	8760			3885		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1991 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		9
15. Reactor Cooling Systems		241
31. Turbine and auxiliaries		201
Total	0	453

## JP-52 KASHIWAZAKI KARIWA-3

**Operator:** TEPCO (Tokyo Electric Power Company)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA  
 DAI-ICHI NUCLEAR POWER STATIONS.

### 5. Historical Summary

**Date of Construction Start:** 07 Mar 1989 **Lifetime Generation:** 100277.0 GW(e)·h  
**Date of First Criticality:** 19 Oct 1992 **Cumulative Energy Availability Factor:** 49.1%  
**Date of Grid Connection:** 08 Dec 1992 **Cumulative Load Factor:** 48.7%  
**Date of Commercial Operation:** 11 Aug 1993 **Cumulative Unit Capability Factor:** 50.0%  
**Cumulative Energy Unavailability Factor:** 50.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1993	3875.8	1067	100.0	100.0	100.0	100.0	98.9	98.9	3672	100.0
1994	7264.4	1067	78.9	85.1	78.9	85.1	77.7	84.0	6961	79.5
1995	9253.9	1067	100.0	91.3	100.0	91.3	99.0	90.2	8760	100.0
1996	7921.6	1067	85.5	89.6	85.5	89.6	84.5	88.5	7508	85.5
1997	8016.2	1067	86.8	88.9	86.8	88.9	85.8	87.9	7601	86.8
1998	6748.0	1067	73.1	86.0	73.1	86.0	72.2	85.0	6467	73.8
1999	9028.3	1067	97.7	87.8	97.7	87.8	96.6	86.8	8568	97.8
2000	7945.1	1067	85.8	87.6	85.8	87.6	84.8	86.5	7539	85.8
2001	6985.7	1067	75.8	86.2	75.8	86.2	74.7	85.1	6639	75.8
2002	5575.5	1067	60.4	83.4	60.4	83.4	59.7	82.4	5300	60.5
2003	0.0	1067	0.0	75.4	0.0	75.4	0.0	74.5	0	0.0
2004	6550.0	1067	69.9	74.9	69.9	74.9	69.9	74.1	6093	69.4
2005	6061.7	1067	64.9	74.1	64.9	74.1	64.9	73.4	5772	65.9
2006	7331.4	1067	78.3	74.5	78.3	74.4	78.4	73.7	6924	79.0
2007	5054.1	1067	71.4	74.2	53.7	73.0	54.1	72.4	4714	53.8
2008	0.0	1067	0.0	69.4	0.0	68.3	0.0	67.7	0	0.0
2009	0.0	1067	0.0	65.2	0.0	64.1	0.0	63.6	0	0.0
2010	0.0	1067	0.0	61.5	0.0	60.4	0.0	59.9	0	0.0
2011	0.0	1067	0.0	58.1	0.0	57.2	0.0	56.7	0	0.0
2012	0.0	1067	0.0	55.1	0.0	54.2	0.0	53.7	0	0.0
2013	0.0	1067	0.0	52.4	0.0	51.6	0.0	51.1	0	0.0
2014	0.0	1067	0.0	50.0	0.0	49.1	0.0	48.7	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1994 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					398	
C. Inspection, maintenance or repair combined with refuelling				1083		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			2505		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						73
Z. Other					66	
Subtotal	8760	0	0	3588	464	73
Total	8760			4125		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1994 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		372
15. Reactor Cooling Systems		26
Total	0	398

## JP-53 KASHIWAZAKI KARIWA-4

Operator: TEPCO (Tokyo Electric Power Company)

Contractor: HITACHI (HITACHI LTD.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA  
 DAI-ICHI NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 05 Mar 1990      Lifetime Generation: 91851.0 GW(e)·h  
 Date of First Criticality: 01 Nov 1993      Cumulative Energy Availability Factor: 47.4%  
 Date of Grid Connection: 21 Dec 1993      Cumulative Load Factor: 46.9%  
 Date of Commercial Operation: 11 Aug 1994      Cumulative Unit Capability Factor: 49.7%  
    Cumulative Energy Unavailability Factor: 52.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1994	3869.5	1067	99.8	99.8	99.8	99.8	98.8	98.8	3672	100.0
1995	6182.5	1067	67.0	76.7	67.0	76.7	66.1	75.8	5889	67.2
1996	8068.0	1067	87.1	81.0	87.1	81.0	86.1	80.0	7651	87.1
1997	7516.7	1067	81.7	81.2	81.5	81.1	80.4	80.2	7207	82.3
1998	9258.7	1067	100.0	85.4	100.0	85.4	99.1	84.4	8760	100.0
1999	8141.7	1067	88.1	85.9	88.1	85.9	87.1	84.9	7719	88.1
2000	6918.9	1067	75.1	84.2	75.1	84.2	73.8	83.2	6602	75.2
2001	5591.4	1067	60.6	81.1	60.6	81.0	59.8	80.0	5343	61.0
2002	9239.9	1067	100.0	83.3	99.9	83.3	98.9	82.3	8760	100.0
2003	4185.8	1067	45.0	79.2	45.0	79.2	44.8	78.3	3946	45.0
2004	5623.7	1067	59.9	77.4	59.9	77.3	60.0	76.5	5258	59.9
2005	7192.0	1067	76.8	77.3	76.8	77.3	76.9	76.6	6755	77.1
2006	2816.5	1067	31.0	73.6	30.4	73.5	30.1	72.8	2772	31.6
2007	5061.7	1067	100.0	75.6	53.8	72.1	54.2	71.4	4714	53.8
2008	0.0	1067	0.0	70.3	0.0	67.1	0.0	66.5	0	0.0
2009	0.0	1067	0.0	65.8	0.0	62.7	0.0	62.2	0	0.0
2010	0.0	1067	0.0	61.8	0.0	58.9	0.0	58.4	0	0.0
2011	0.0	1067	0.0	58.2	0.0	55.5	0.0	55.0	0	0.0
2012	0.0	1067	0.0	55.0	0.0	52.5	0.0	52.0	0	0.0
2013	0.0	1067	0.0	52.2	0.0	49.8	0.0	49.4	0	0.0
2014	0.0	1067	0.0	49.7	0.0	47.4	0.0	46.9	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1995 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					304	
C. Inspection, maintenance or repair combined with refuelling				1081	14	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			2630		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						202
Z. Other					31	
Subtotal	8760	0	0	3711	349	202
Total	8760			4262		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1995 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		143
31. Turbine and auxiliaries		25
41. Main Generator Systems		93
42. Electrical Power Supply Systems		42
Total	0	303

## JP-40 KASHIWAZAKI KARIWA-5

Operator: TEPCO (Tokyo Electric Power Company)

Contractor: HITACHI (HITACHI LTD.)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1067.0 MW(e)

Design Net Capacity: 1067.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA DAI-ICHI NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 20 Jun 1985      Lifetime Generation: 136968.0 GW(e)·h

Date of First Criticality: 20 Jul 1989      Cumulative Energy Availability Factor: 58.8%

Date of Grid Connection: 12 Sep 1989      Cumulative Load Factor: 58.3%

Date of Commercial Operation: 10 Apr 1990      Cumulative Unit Capability Factor: 60.9%

Cumulative Energy Unavailability Factor: 41.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1990	6953.3	1067	100.0	100.0	100.0	100.0	98.7	98.7	6600	100.0
1991	7093.3	1067	76.7	86.7	76.7	86.7	75.9	85.7	6789	77.5
1992	6977.5	1067	75.5	82.6	75.5	82.6	74.4	81.6	6715	76.4
1993	9238.2	1067	99.9	87.2	99.9	87.2	98.8	86.2	8760	100.0
1994	7154.7	1067	77.5	85.2	77.5	85.2	76.5	84.2	6825	77.9
1995	7508.3	1067	81.5	84.5	81.5	84.5	80.3	83.5	7183	82.0
1996	7905.8	1067	85.6	84.7	85.6	84.7	84.4	83.6	7524	85.7
1997	8919.1	1067	96.6	86.2	96.6	86.2	95.4	85.1	8472	96.7
1998	7352.6	1067	79.6	85.5	79.6	85.5	78.7	84.4	6995	79.9
1999	7771.8	1067	84.3	85.4	84.3	85.4	83.1	84.3	7383	84.3
2000	7042.7	1067	76.4	84.5	76.3	84.5	75.1	83.4	6712	76.4
2001	9198.6	1067	99.6	85.8	99.6	85.8	98.4	84.7	8760	100.0
2002	8191.0	1067	88.3	86.0	88.3	86.0	87.6	84.9	7743	88.4
2003	1503.1	1067	16.1	80.9	16.1	80.9	16.1	79.9	1392	15.9
2004	6134.8	1067	65.3	79.9	65.3	79.8	65.5	78.9	5738	65.3
2005	6852.9	1067	73.0	79.4	73.0	79.4	73.3	78.6	6446	73.6
2006	8400.5	1067	89.5	80.0	89.5	80.0	89.9	79.3	7848	89.6
2007	0.0	1067	51.0	78.4	0.0	75.5	0.0	74.8	0	0.0
2008	0.0	1067	0.0	74.2	0.0	71.5	0.0	70.8	0	0.0
2009	0.0	1067	0.0	70.4	0.0	67.9	0.0	67.2	0	0.0
2010	780.1	1067	8.6	67.5	8.6	65.0	8.3	64.4	888	10.1
2011	9402.1	1067	100.0	69.0	100.0	66.6	100.6	66.0	8760	100.0

2012	589.2	1067	6.5	66.2	6.4	64.0	6.3	63.4	576	6.6
2013	0.0	1067	0.0	63.4	0.0	61.3	0.0	60.7	0	0.0
2014	0.0	1067	0.0	60.9	0.0	58.8	0.0	58.3	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1991 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					213	
C. Inspection, maintenance or repair combined with refuelling				1131		
D. Inspection, maintenance or repair without refuelling				9		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				342		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			1424		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						186
Z. Other					40	
Subtotal	8760	0	0	2906	253	186
Total	8760			3345		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1991 to 2014 Average Hours Lost Per Year
15. Reactor Cooling Systems		207
31. Turbine and auxiliaries		5
Total	0	212

## JP-55 KASHIWAZAKI KARIWA-6

Operator: TEPCO (Tokyo Electric Power Company)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1315.0 MW(e)

Design Net Capacity: 1315.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA DAI-ICHI NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 03 Nov 1992      Lifetime Generation: 133581.0 GW(e)·h

Date of First Criticality: 18 Dec 1995      Cumulative Energy Availability Factor: 61.3%

Date of Grid Connection: 29 Jan 1996      Cumulative Load Factor: 62.1%

Date of Commercial Operation: 07 Nov 1996      Cumulative Unit Capability Factor: 63.6%

   Cumulative Energy Unavailability Factor: 38.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1996	1920.8	1315	100.0	100.0	100.0	100.0	99.8	99.8	1464	100.0
1997	10161.5	1315	88.4	90.1	88.4	90.1	88.2	89.9	7752	88.5
1998	10702.3	1315	93.3	91.6	93.3	91.6	92.9	91.3	8217	93.8
1999	9710.4	1315	84.8	89.4	84.8	89.4	84.3	89.1	7480	85.4
2000	9411.6	1315	81.8	87.6	81.8	87.6	81.5	87.2	7183	81.8
2001	9270.0	1315	80.7	86.3	80.7	86.3	80.5	85.9	7079	80.8
2002	11504.1	1315	100.0	88.5	100.0	88.5	99.9	88.2	8760	100.0
2003	8401.2	1315	71.5	86.1	71.5	86.1	72.9	86.1	6163	70.4
2004	8635.2	1315	72.7	84.5	72.7	84.5	74.8	84.7	6410	73.0
2005	11126.5	1315	93.9	85.5	93.9	85.5	96.6	86.0	8232	94.0
2006	8446.7	1315	71.4	84.1	71.4	84.1	73.3	84.7	6301	71.9
2007	3758.2	1315	73.0	83.1	31.6	79.4	32.6	80.1	2787	31.8
2008	0.0	1315	0.0	76.3	0.0	72.9	0.0	73.5	0	0.0
2009	3653.8	1315	30.9	72.8	30.9	69.7	31.7	70.3	2818	32.2
2010	9522.1	1315	80.6	73.4	80.6	70.5	82.7	71.2	7089	80.9
2011	10960.3	1315	92.7	74.7	92.7	71.9	95.1	72.8	8147	93.0
2012	2756.3	1315	23.1	71.5	23.1	68.9	23.9	69.7	2040	23.2
2013	0.0	1315	0.0	67.3	0.0	64.9	0.0	65.7	0	0.0
2014	0.0	1315	0.0	63.6	0.0	61.3	0.0	62.1	0	0.0

### 6. Full Outages, Analysis by Cause

	2014 Hours Lost	1997 to 2014
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Outage Cause	2014 Hours Lost			Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					94	
C. Inspection, maintenance or repair combined with refuelling				862		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				374		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			1298		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						201
Z. Other					90	
Subtotal	8760	0	0	2534	184	201
Total	8760			2919		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1997 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		18
12. Reactor I&C Systems		18
13. Reactor Auxiliary Systems		4
32. Feedwater and Main Steam System		35
41. Main Generator Systems		11
42. Electrical Power Supply Systems		5
Total	0	91

## JP-56 KASHIWAZAKI KARIWA-7

Operator: TEPCO (Tokyo Electric Power Company)

Contractor: HITACHI (HITACHI LTD.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1315.0 MW(e)  
 Design Net Capacity: 1315.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA  
 DAI-ICHI NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 01 Jul 1993      Lifetime Generation: 116411.0 GW(e)·h  
 Date of First Criticality: 01 Nov 1996      Cumulative Energy Availability Factor: 56.0%  
 Date of Grid Connection: 17 Dec 1996      Cumulative Load Factor: 56.6%  
 Date of Commercial Operation: 02 Jul 1997      Cumulative Unit Capability Factor: 58.2%  
    Cumulative Energy Unavailability Factor: 44.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1997	5792.8	1315	100.0	100.0	100.0	100.0	99.8	99.8	4416	100.0
1998	9715.6	1315	84.7	89.8	84.7	89.8	84.3	89.5	7452	85.1
1999	8445.4	1315	73.7	83.4	73.7	83.4	73.3	83.0	6458	73.7
2000	11240.2	1315	97.6	87.4	97.6	87.4	97.3	87.1	8587	97.8
2001	10078.4	1315	87.8	87.5	87.8	87.5	87.5	87.2	7752	88.5
2002	7990.0	1315	69.5	84.2	68.9	84.1	69.4	84.0	6089	69.5
2003	5778.5	1315	49.2	78.9	49.2	78.8	50.2	78.8	4302	49.1
2004	10805.2	1315	94.5	80.9	91.6	80.5	93.5	80.7	8057	91.7
2005	7977.5	1315	68.0	79.4	68.0	79.0	69.3	79.4	6007	68.6
2006	8166.2	1315	69.9	78.4	69.5	78.0	70.9	78.5	6250	71.3
2007	6358.6	1315	87.1	79.2	53.8	75.7	55.2	76.3	4714	53.8
2008	0.0	1315	0.0	72.3	0.0	69.1	0.0	69.6	0	0.0
2009	5366.3	1315	45.8	70.2	45.8	67.3	46.6	67.8	4338	49.5
2010	9033.9	1315	77.2	70.7	77.2	68.0	78.4	68.6	7041	80.4
2011	7348.7	1315	62.9	70.2	62.9	67.6	63.8	68.3	5616	64.1
2012	0.0	1315	0.0	65.7	0.0	63.3	0.0	63.8	0	0.0
2013	0.0	1315	0.0	61.7	0.0	59.4	0.0	60.0	0	0.0
2014	0.0	1315	0.0	58.2	0.0	56.0	0.0	56.6	0	0.0

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost	1998 to 2014 Average Hours Lost Per Year
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	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					183	
C. Inspection, maintenance or repair combined with refuelling				1075		
D. Inspection, maintenance or repair without refuelling				56		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				66		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			1809		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						186
Z. Other					22	
Subtotal	8760	0	0	3006	205	186
Total	8760			3397		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1998 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		63
12. Reactor I&C Systems		55
15. Reactor Cooling Systems		64
Total	0	182

## JP-4 MIHAMA-1

Operator: KEPCO (Kansai Electric Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 320.0 MW(e)

Design Net Capacity: 320.0 MW(e)

Design Discharge Burnup: 31500 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(10/11/24-) IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 01 Feb 1967      Lifetime Generation: 60115.0 GW(e)·h

Date of First Criticality: 29 Jul 1970      Cumulative Energy Availability Factor: 47.9%

Date of Grid Connection: 08 Aug 1970      Cumulative Load Factor: 48.7%

Date of Commercial Operation: 28 Nov 1970      Cumulative Unit Capability Factor: 48.1%

Cumulative Energy Unavailability Factor: 52.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1970	337.0	320	100.0	100.0	100.0	100.0	71.9	71.9	1017	69.5
1971	1953.8	320	100.0	100.0	100.0	100.0	69.7	70.0	5977	68.2
1972	1260.0	320	47.8	75.9	47.4	75.7	44.8	58.4	4156	47.3
1973	945.3	320	47.9	67.1	47.9	66.9	33.7	50.6	4865	55.5
1974	391.8	320	20.9	56.0	20.9	55.9	14.0	41.8	2151	24.6
1975	0.0	320	0.0	45.2	0.0	45.1	0.0	33.7	0	0.0
1976	0.0	320	0.0	37.8	0.0	37.8	0.0	28.2	0	0.0
1977	0.0	320	0.0	32.6	0.0	32.5	0.0	24.3	0	0.0
1978	118.7	320	4.2	29.1	4.2	29.0	4.2	21.9	1059	12.1
1979	115.4	320	4.1	26.4	4.1	26.3	4.1	19.9	1014	11.6
1980	1012.9	320	36.0	27.3	36.0	27.3	36.0	21.5	4472	50.9
1981	1178.1	320	42.0	28.6	42.0	28.6	42.0	23.3	3931	44.9
1982	92.8	320	3.3	26.6	3.3	26.5	3.3	21.7	455	5.2
1983	1164.4	320	41.5	27.7	41.5	27.7	41.5	23.2	3731	42.6
1984	1576.6	320	56.0	29.7	56.0	29.7	56.1	25.5	5053	57.5
1985	2240.2	320	80.0	33.0	80.0	33.0	79.9	29.1	7077	80.8
1986	2707.2	320	96.6	36.9	96.3	36.9	96.6	33.3	8482	96.8
1987	2261.5	320	81.6	39.5	81.6	39.5	80.7	36.0	7150	81.6
1988	2075.4	320	75.4	41.5	75.4	41.5	73.8	38.1	6623	75.4
1989	1693.2	320	61.8	42.6	61.8	42.5	60.4	39.3	5418	61.8
1990	1938.2	320	66.9	43.8	66.9	43.7	69.1	40.8	6058	69.2
1991	2371.9	320	8.8	42.1	4.5	41.9	84.6	42.8	7615	86.9

1992	1041.1	320	37.2	41.9	37.2	41.7	37.0	42.6	3511	40.0
1993	1663.3	320	58.5	42.6	58.5	42.4	59.3	43.3	5300	60.5
1994	369.9	320	13.4	41.4	13.4	41.2	13.2	42.1	1160	13.2
1995	0.0	320	0.0	39.8	0.0	39.6	0.0	40.4	0	0.0
1996	2245.9	320	79.7	41.3	79.7	41.1	79.9	41.9	7186	81.8
1997	2271.5	320	80.8	42.7	80.8	42.6	81.0	43.3	7083	80.9
1998	2321.5	320	82.5	44.2	82.5	44.0	82.8	44.7	7304	83.4
1999	2530.4	320	90.0	45.7	90.0	45.6	90.3	46.3	8013	91.5
2000	2381.2	320	84.6	47.0	84.5	46.9	84.7	47.6	7439	84.7
2001	2104.4	320	75.0	47.9	74.9	47.8	75.1	48.5	6574	75.0
2002	2158.6	320	77.1	48.8	76.6	48.7	77.0	49.3	6767	77.2
2003	2880.6	320	99.9	50.4	99.9	50.2	102.8	51.0	8760	100.0
2004	1764.2	320	61.3	50.7	61.3	50.5	62.8	51.3	5389	61.4
2005	1194.9	320	41.4	50.4	41.4	50.3	42.6	51.1	4022	45.9
2006	2353.3	320	83.3	51.3	83.3	51.2	84.0	52.0	7305	83.4
2007	854.7	320	30.3	50.8	30.3	50.6	30.5	51.4	2723	31.1
2008	2119.5	320	74.7	51.4	74.7	51.2	75.4	52.0	6561	74.7
2009	2070.1	320	72.2	51.9	72.2	51.8	73.8	52.6	6390	72.9
2010	2521.4	320	89.6	52.9	88.3	52.7	89.9	53.5	7859	89.7
2011	0.0	320	0.0	51.6	0.0	51.4	0.0	52.2	0	0.0
2012	0.0	320	0.0	50.4	0.0	50.2	0.0	51.0	0	0.0
2013	0.0	320	0.0	49.2	0.0	49.0	0.0	49.8	0	0.0
2014	0.0	320	0.0	48.1	0.0	47.9	0.0	48.7	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					1566	
C. Inspection, maintenance or repair combined with refuelling				1688		
D. Inspection, maintenance or repair without refuelling				250		
E. Testing of plant systems or components					3	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			546		
J. Grid limitation, failure or grid unavailability						2
Z. Other					97	
Subtotal	8760	0	0	2484	1666	2
Total	8760			4152		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		11
14. Safety Systems		76
15. Reactor Cooling Systems		50
16. Steam generation systems		1274
31. Turbine and auxiliaries		105
32. Feedwater and Main Steam System		36
42. Electrical Power Supply Systems		0
XX. Miscellaneous Systems		5
Total	0	1562

## JP-6 MIHAMA-2

Operator: KEPCO (Kansai Electric Power Co.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 470.0 MW(e)  
 Design Net Capacity: 470.0 MW(e)  
 Design Discharge Burnup: 33300 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(11/12/18-) IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 29 May 1968      Lifetime Generation: 101601.0 GW(e)·h  
 Date of First Criticality: 10 Apr 1972      Cumulative Energy Availability Factor: 58.0%  
 Date of Grid Connection: 21 Apr 1972      Cumulative Load Factor: 58.1%  
 Date of Commercial Operation: 25 Jul 1972      Cumulative Unit Capability Factor: 58.0%  
    Cumulative Energy Unavailability Factor: 42.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1972	1318.0	492	67.5	67.5	67.5	67.5	59.7	59.7	3212	72.7
1973	2509.3	470	63.3	64.8	63.3	64.8	60.9	60.5	5569	63.6
1974	3122.8	470	77.0	69.6	77.0	69.6	75.8	66.6	6766	77.2
1975	260.3	470	6.4	51.7	6.4	51.7	6.3	49.5	818	9.3
1976	2828.2	470	68.7	55.5	68.7	55.5	68.5	53.7	7011	79.8
1977	1648.0	470	40.0	52.7	40.0	52.7	40.0	51.2	3679	42.0
1978	2648.7	470	64.5	54.5	64.5	54.5	64.3	53.2	5852	66.8
1979	867.1	470	21.1	50.1	21.1	50.1	21.1	49.0	1944	22.2
1980	3032.7	470	73.3	52.8	73.3	52.8	73.5	51.9	6622	75.4
1981	2762.9	470	66.9	54.3	66.9	54.3	67.1	53.4	5982	68.3
1982	2238.9	470	54.2	54.3	54.2	54.3	54.4	53.5	4958	56.6
1983	1433.8	470	34.7	52.6	34.7	52.6	34.8	51.9	3262	37.2
1984	3937.3	470	96.3	56.1	96.3	56.1	95.4	55.4	8458	96.3
1985	2898.3	470	70.2	57.1	70.2	57.1	70.4	56.5	6219	71.0
1986	3301.5	470	80.2	58.7	80.0	58.7	80.2	58.1	7100	81.1
1987	2766.2	470	67.7	59.3	67.7	59.3	67.2	58.7	5927	67.7
1988	3223.1	470	77.8	60.4	77.8	60.4	78.1	59.9	6850	78.0
1989	3325.2	470	81.2	61.6	81.2	61.6	80.8	61.1	7112	81.2
1990	3077.1	470	72.7	62.2	72.7	62.2	74.7	61.8	6594	75.3
1991	447.1	470	10.0	59.5	10.0	59.5	10.9	59.2	950	10.8
1992	0.0	470	0.0	56.6	0.0	56.6	0.0	56.3	0	0.0
1993	0.0	470	0.0	54.0	0.0	54.0	0.0	53.7	0	0.0

1994	1186.3	470	29.9	52.9	29.9	52.9	28.8	52.6	2522	28.8
1995	3335.0	470	80.7	54.1	80.5	54.1	81.0	53.8	7138	81.5
1996	3762.4	470	90.6	55.6	90.5	55.6	91.1	55.3	8024	91.3
1997	3006.0	470	72.6	56.2	72.6	56.2	73.0	56.0	6417	73.3
1998	3396.3	470	82.0	57.2	82.0	57.2	82.5	57.0	7228	82.5
1999	2746.4	470	66.3	57.5	66.3	57.5	66.7	57.4	5821	66.4
2000	3839.7	470	92.5	58.8	92.5	58.8	93.0	58.6	8137	92.6
2001	2911.3	470	70.4	59.2	70.3	59.1	70.7	59.0	6177	70.5
2002	3611.3	470	87.2	60.1	87.2	60.1	87.7	60.0	7648	87.3
2003	3400.2	470	81.5	60.8	81.5	60.7	82.6	60.7	7182	82.0
2004	2942.3	470	70.2	61.1	70.2	61.0	71.3	61.0	6170	70.2
2005	3525.4	470	84.8	61.8	84.8	61.7	85.6	61.7	7470	85.3
2006	3110.9	470	75.0	62.1	75.0	62.1	75.6	62.1	6671	76.2
2007	2294.2	470	54.8	61.9	54.8	61.9	55.7	62.0	4811	54.9
2008	1713.1	470	41.6	61.4	41.6	61.4	41.5	61.4	3678	41.9
2009	3161.6	470	75.8	61.8	75.8	61.7	76.8	61.8	6688	76.3
2010	2356.3	470	56.7	61.6	56.3	61.6	57.2	61.7	5099	58.2
2011	3864.0	470	93.3	62.4	92.8	62.4	93.9	62.5	8187	93.5
2012	0.0	470	0.0	60.9	0.0	60.9	0.0	61.0	0	0.0
2013	0.0	470	0.0	59.4	0.0	59.4	0.0	59.5	0	0.0
2014	0.0	470	0.0	58.0	0.0	58.0	0.0	58.1	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					465	
C. Inspection, maintenance or repair combined with refuelling				2295	35	
D. Inspection, maintenance or repair without refuelling				73		
F. Major back-fitting, refurbishment or upgrading activities with refuelling	8760			415		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					0	
Z. Other					60	
Subtotal	8760	0	0	2783	560	0
Total	8760			3343		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		37
13. Reactor Auxiliary Systems		58
15. Reactor Cooling Systems		3
16. Steam generation systems		319
31. Turbine and auxiliaries		21
32. Feedwater and Main Steam System		0
41. Main Generator Systems		3
42. Electrical Power Supply Systems		21
Total	0	462

# JP-14 MIHAMA-3

Operator: KEPCO (Kansai Electric Power Co.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 780.0 MW(e)  
 Design Net Capacity: 780.0 MW(e)  
 Design Discharge Burnup: 43000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(11/5/14-) IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

## 5. Historical Summary

Date of Construction Start: 07 Aug 1972      Lifetime Generation: 168850.0 GW(e)·h  
 Date of First Criticality: 28 Jan 1976      Cumulative Energy Availability Factor: 64.2%  
 Date of Grid Connection: 19 Feb 1976      Cumulative Load Factor: 64.8%  
 Date of Commercial Operation: 01 Dec 1976      Cumulative Unit Capability Factor: 64.2%  
    Cumulative Energy Unavailability Factor: 35.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1976	493.6	780	85.1	85.1	85.1	85.1	85.1	85.1	744	100.0
1977	4498.5	780	65.8	67.4	65.8	67.4	65.8	67.3	6159	70.3
1978	4166.6	780	59.5	63.6	59.5	63.6	61.0	64.3	5537	63.2
1979	1697.4	780	24.8	51.0	24.8	51.0	24.8	51.5	2307	26.3
1980	4597.7	780	67.0	55.0	67.0	55.0	67.1	55.3	5964	67.9
1981	5832.9	780	85.2	60.9	85.2	60.9	85.4	61.2	7607	86.8
1982	5239.1	780	76.4	63.4	76.4	63.4	76.7	63.8	6952	79.4
1983	4818.0	780	70.6	64.4	70.6	64.4	70.5	64.7	6330	72.3
1984	5353.7	780	77.8	66.1	77.8	66.1	78.1	66.4	6906	78.6
1985	4971.9	780	72.6	66.8	72.6	66.8	72.8	67.1	6426	73.4
1986	6848.4	780	99.8	70.1	99.8	70.1	100.2	70.4	8760	100.0
1987	4822.7	780	71.6	70.2	71.6	70.2	70.6	70.4	6268	71.6
1988	4261.3	780	64.0	69.7	64.0	69.7	62.2	69.7	5625	64.0
1989	5299.7	780	78.0	70.3	78.0	70.3	77.6	70.3	6834	78.0
1990	6867.0	780	100.0	72.4	100.0	72.4	100.5	72.5	8760	100.0
1991	4246.2	780	59.7	71.6	59.7	71.6	62.1	71.8	5495	62.7
1992	4709.9	780	68.5	71.4	68.5	71.4	68.7	71.6	6095	69.4
1993	4526.6	780	66.4	71.1	66.1	71.1	66.2	71.3	5951	67.9
1994	6623.0	780	96.8	72.5	96.8	72.5	96.9	72.7	8486	96.9
1995	3389.2	780	49.7	71.3	49.6	71.3	49.6	71.5	4534	51.8
1996	4491.4	780	65.5	71.1	65.3	71.0	65.6	71.2	5760	65.6
1997	6262.8	780	91.2	72.0	91.2	72.0	91.7	72.2	7963	90.9



1998	5979.9	780	87.1	72.7	87.1	72.7	87.5	72.8	7788	88.9
1999	5795.3	780	84.4	73.2	84.4	73.2	84.8	73.4	7398	84.5
2000	4785.0	780	69.6	73.1	69.6	73.0	69.8	73.2	6117	69.6
2001	6853.7	780	100.0	74.1	100.0	74.1	100.3	74.3	8760	100.0
2002	5248.0	780	76.8	74.2	76.8	74.2	76.8	74.4	6732	76.8
2003	6111.5	780	87.9	74.7	87.9	74.7	89.4	74.9	7701	87.9
2004	4301.3	780	60.5	74.2	60.5	74.2	62.8	74.5	5319	60.6
2005	0.0	780	0.0	71.7	0.0	71.7	0.0	72.0	0	0.0
2006	92.1	780	1.4	69.3	1.4	69.3	1.3	69.6	181	2.1
2007	4943.9	780	69.5	69.3	69.5	69.3	72.4	69.7	6190	70.7
2008	5725.5	780	79.7	69.7	79.7	69.6	83.6	70.1	7049	80.2
2009	6795.5	780	94.9	70.4	94.9	70.4	99.5	71.0	8315	94.9
2010	5541.0	780	77.4	70.6	77.4	70.6	81.1	71.3	6823	77.9
2011	2637.1	780	36.5	69.7	36.5	69.6	38.6	70.4	3203	36.6
2012	0.0	780	0.0	67.7	0.0	67.7	0.0	68.4	0	0.0
2013	0.0	780	0.0	65.9	0.0	65.9	0.0	66.6	0	0.0
2014	0.0	780	0.0	64.2	0.0	64.2	0.0	64.8	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1976 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					112	
C. Inspection, maintenance or repair combined with refuelling				2096		
E. Testing of plant systems or components				0	3	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			556		
L. Human factor related					6	
Subtotal	8760	0	0	2652	121	0
Total	8760			2773		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1976 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		28
15. Reactor Cooling Systems		9
16. Steam generation systems		24
32. Feedwater and Main Steam System		46
XX. Miscellaneous Systems		3
Total	0	110

# JP-15 OHI-1

Operator: KEPCO (Kansai Electric Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1120.0 MW(e)  
 Design Net Capacity: 1120.0 MW(e)  
 Design Discharge Burnup: 44000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(10/12/10-) IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

## 5. Historical Summary

Date of Construction Start: 26 Oct 1972      Lifetime Generation: 213316.0 GW(e)·h  
 Date of First Criticality: 02 Dec 1977      Cumulative Energy Availability Factor: 60.2%  
 Date of Grid Connection: 23 Dec 1977      Cumulative Load Factor: 60.7%  
 Date of Commercial Operation: 27 Mar 1979      Cumulative Unit Capability Factor: 60.2%  
    Cumulative Energy Unavailability Factor: 39.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979	3900.2	1120	47.3	47.3	47.3	47.3	47.4	47.4	3701	50.4
1980	3890.5	1120	39.3	42.9	39.3	42.9	39.5	43.1	3635	41.4
1981	3035.4	1120	30.9	38.7	30.9	38.7	30.9	38.8	2938	33.5
1982	6659.8	1120	67.5	46.2	67.5	46.2	67.9	46.4	6076	69.4
1983	8212.6	1120	83.0	53.8	83.0	53.8	83.7	54.1	7282	83.1
1984	7015.1	1120	70.8	56.7	70.8	56.7	71.3	57.1	6292	71.6
1985	5794.1	1120	59.0	57.0	58.7	57.0	59.1	57.3	5217	59.6
1986	5138.8	1120	52.2	56.4	52.2	56.4	52.4	56.7	4664	53.2
1987	9421.7	1120	95.3	60.8	95.3	60.8	96.0	61.2	8430	96.2
1988	3282.4	1120	34.8	58.2	34.8	58.1	33.4	58.3	3053	34.8
1989	2744.9	1120	29.5	55.5	29.5	55.5	28.0	55.5	2587	29.5
1990	5446.5	1120	52.9	55.3	52.9	55.3	55.5	55.5	4919	56.2
1991	5706.3	1120	55.8	55.3	55.8	55.3	58.2	55.7	5160	58.9
1992	5488.2	1120	55.5	55.3	55.4	55.3	55.8	55.7	4957	56.4
1993	5010.3	1120	50.7	55.0	50.7	55.0	51.1	55.4	4535	51.8
1994	6929.9	1120	70.2	56.0	69.9	55.9	70.6	56.4	6202	70.8
1995	6537.9	1120	66.1	56.6	66.1	56.6	66.6	57.0	6010	68.6
1996	7026.3	1120	70.7	57.4	70.7	57.3	71.4	57.8	6305	71.8
1997	7998.8	1120	80.8	58.6	80.7	58.6	81.5	59.1	7080	80.8
1998	9406.5	1120	95.0	60.5	95.0	60.4	95.9	60.9	8359	95.4
1999	6933.7	1120	70.0	60.9	70.0	60.9	70.7	61.4	6136	70.0
2000	6323.6	1120	63.7	61.0	63.6	61.0	64.3	61.5	5668	64.5

2001	9333.1	1120	94.5	62.5	94.2	62.5	95.1	63.0	8273	94.4
2002	7935.8	1120	80.3	63.3	80.2	63.2	80.9	63.7	7038	80.3
2003	8118.7	1120	81.8	64.0	81.8	63.9	82.7	64.5	7142	81.5
2004	7777.0	1120	77.7	64.5	77.7	64.5	79.1	65.1	6825	77.7
2005	7272.5	1120	75.1	64.9	75.1	64.9	74.1	65.4	6510	74.3
2006	9628.3	1120	97.3	66.1	97.3	66.0	98.1	66.6	8530	97.4
2007	6522.9	1120	65.5	66.1	65.5	66.0	66.5	66.6	5796	66.2
2008	8316.9	1120	83.3	66.6	83.3	66.6	84.5	67.2	7344	83.6
2009	6817.3	1120	68.6	66.7	68.6	66.7	69.5	67.3	6040	68.9
2010	6540.1	1120	66.1	66.7	66.1	66.6	66.7	67.2	5824	66.5
2011	3390.7	1120	34.1	65.7	34.1	65.7	34.6	66.2	3026	34.5
2012	0.0	1120	0.0	63.7	0.0	63.7	0.0	64.3	0	0.0
2013	0.0	1120	0.0	61.9	0.0	61.9	0.0	62.4	0	0.0
2014	0.0	1120	0.0	60.2	0.0	60.2	0.0	60.7	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1979 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					381	
C. Inspection, maintenance or repair combined with refuelling				2172		
E. Testing of plant systems or components				39		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			555		
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Z. Other					15	
Subtotal	8760	0	0	2766	398	4
Total	8760			3168		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1979 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		68
12. Reactor I&C Systems		11
13. Reactor Auxiliary Systems		2
14. Safety Systems		49
15. Reactor Cooling Systems		28
16. Steam generation systems		183
21. Fuel Handling and Storage Facilities		18
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		10
42. Electrical Power Supply Systems		1
Total	0	377

## JP-19 OHI-2

Operator: KEPCO (Kansai Electric Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1120.0 MW(e)  
 Design Net Capacity: 1120.0 MW(e)  
 Design Discharge Burnup: 44000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(11/12/16-) IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 08 Dec 1972      Lifetime Generation: 231695.0 GW(e)·h  
 Date of First Criticality: 14 Sep 1978      Cumulative Energy Availability Factor: 66.5%  
 Date of Grid Connection: 11 Oct 1978      Cumulative Load Factor: 67.3%  
 Date of Commercial Operation: 05 Dec 1979      Cumulative Unit Capability Factor: 66.6%  
    Cumulative Energy Unavailability Factor: 33.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979	839.3	1120	100.0	100.0	100.0	100.0	100.7	100.7	744	100.0
1980	5466.4	1120	55.2	58.7	55.2	58.7	55.6	59.1	4976	56.6
1981	5031.7	1120	51.0	55.0	51.0	55.0	51.3	55.4	4668	53.3
1982	8648.6	1120	87.6	65.6	87.6	65.6	88.2	66.0	7877	89.9
1983	7443.8	1120	75.2	67.9	75.2	67.9	75.9	68.4	6670	76.1
1984	5793.5	1120	58.5	66.1	58.5	66.1	58.9	66.5	5208	59.3
1985	6843.0	1120	69.2	66.6	69.2	66.6	69.7	67.1	6260	71.5
1986	9858.9	1120	99.5	71.2	99.5	71.2	100.5	71.8	8760	100.0
1987	6238.1	1120	66.8	70.7	65.3	70.5	63.6	70.8	5789	66.1
1988	6112.3	1120	62.9	69.8	62.9	69.7	62.1	69.8	5525	62.9
1989	9828.0	1120	99.4	72.8	99.4	72.6	100.2	72.8	8707	99.4
1990	6685.7	1120	66.1	72.2	66.1	72.0	68.1	72.4	6069	69.3
1991	6409.5	1120	71.3	72.1	69.4	71.8	65.3	71.8	5903	67.4
1992	6973.3	1120	70.2	71.9	70.2	71.7	70.9	71.7	6178	70.3
1993	8863.9	1120	89.5	73.2	89.5	72.9	90.3	73.1	7903	90.2
1994	6680.0	1120	67.9	72.8	67.9	72.6	68.1	72.7	5929	67.7
1995	3273.5	1120	33.4	70.4	33.3	70.2	33.4	70.3	3060	34.9
1996	9738.2	1120	98.3	72.0	98.0	71.8	99.0	72.0	8662	98.6
1997	5316.5	1120	53.7	71.0	53.7	70.8	54.2	71.0	4753	54.3
1998	6501.3	1120	65.7	70.7	65.6	70.5	66.3	70.7	5760	65.8
1999	4511.1	1120	45.6	69.5	45.6	69.3	46.0	69.5	3994	45.6
2000	7796.8	1120	78.6	69.9	78.6	69.7	79.3	70.0	6987	79.5

2001	7163.5	1120	71.3	70.0	71.3	69.8	73.0	70.1	6302	71.9
2002	8265.6	1120	83.6	70.6	83.6	70.4	84.2	70.7	7326	83.6
2003	10075.6	1120	100.0	71.8	100.0	71.6	102.7	72.0	8760	100.0
2004	8408.3	1120	83.4	72.3	83.4	72.1	85.5	72.6	7324	83.4
2005	6970.4	1120	70.6	72.2	70.6	72.0	71.0	72.5	6139	70.1
2006	7003.7	1120	69.1	72.1	69.1	71.9	71.4	72.5	6085	69.5
2007	7759.9	1120	76.8	72.2	76.8	72.1	79.1	72.7	6768	77.3
2008	10041.5	1120	99.1	73.2	99.1	73.0	102.1	73.7	8784	100.0
2009	5960.7	1120	59.0	72.7	59.0	72.6	60.8	73.3	5201	59.4
2010	5483.8	1120	54.2	72.1	54.2	72.0	55.9	72.7	4803	54.8
2011	9684.1	1120	95.7	72.8	95.7	72.7	98.7	73.5	8392	95.8
2012	0.0	1120	0.0	70.6	0.0	70.5	0.0	71.3	0	0.0
2013	0.0	1120	0.0	68.6	0.0	68.4	0.0	69.2	0	0.0
2014	0.0	1120	0.0	66.6	0.0	66.5	0.0	67.3	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					342	
C. Inspection, maintenance or repair combined with refuelling				1751		
D. Inspection, maintenance or repair without refuelling				12		
E. Testing of plant systems or components					3	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				57		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			453		
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					6	
Z. Other					24	
Subtotal	8760	0	0	2273	375	3
Total	8760			2651		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		66
12. Reactor I&C Systems		116
13. Reactor Auxiliary Systems		23
14. Safety Systems		0
15. Reactor Cooling Systems		8
16. Steam generation systems		94
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		9
41. Main Generator Systems		5
42. Electrical Power Supply Systems		8
Total	0	336

## JP-50 OHI-3

Operator: KEPCO (Kansai Electric Power Co.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1127.0 MW(e)  
 Design Net Capacity: 1127.0 MW(e)  
 Design Discharge Burnup: 44000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(13/9/2-) IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 03 Oct 1987      Lifetime Generation: 167871.0 GW(e)·h  
 Date of First Criticality: 17 May 1991      Cumulative Energy Availability Factor: 72.9%  
 Date of Grid Connection: 07 Jun 1991      Cumulative Load Factor: 73.8%  
 Date of Commercial Operation: 18 Dec 1991      Cumulative Unit Capability Factor: 73.0%  
    Cumulative Energy Unavailability Factor: 27.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1991	843.6	1127	100.0	100.0	100.0	100.0	100.6	100.6	744	100.0
1992	9954.7	1127	100.0	100.0	100.0	100.0	100.6	100.6	8784	100.0
1993	7863.7	1127	79.4	90.1	79.4	90.1	79.7	90.5	7025	80.2
1994	8139.1	1127	82.5	87.7	82.5	87.7	82.4	87.9	7265	82.9
1995	7701.7	1127	77.8	85.3	77.8	85.3	78.0	85.5	6887	78.6
1996	9957.4	1127	100.0	88.2	100.0	88.2	100.6	88.5	8784	100.0
1997	8333.0	1127	83.9	87.5	83.9	87.5	84.4	87.8	7385	84.3
1998	8872.7	1127	89.3	87.7	89.3	87.7	89.9	88.1	7867	89.8
1999	8892.3	1127	89.9	88.0	89.5	87.9	90.1	88.3	7875	89.9
2000	8868.9	1127	89.1	88.1	89.1	88.1	89.6	88.5	7824	89.1
2001	8474.7	1127	85.4	87.8	85.4	87.8	85.8	88.2	7481	85.4
2002	9918.7	1127	100.0	88.9	100.0	88.9	100.5	89.3	8760	100.0
2003	8683.2	1127	85.9	88.7	85.9	88.6	88.0	89.2	7525	85.9
2004	3040.2	1127	30.0	84.2	30.0	84.2	30.7	84.7	2634	30.0
2005	7834.0	1127	77.6	83.7	77.6	83.7	79.4	84.3	6968	79.5
2006	8012.3	1127	79.6	83.5	79.6	83.4	81.2	84.1	7001	79.9
2007	10080.1	1127	100.0	84.5	100.0	84.5	102.1	85.3	8760	100.0
2008	2355.6	1127	23.4	80.9	23.4	80.9	23.8	81.6	2081	23.7
2009	8335.2	1127	83.1	81.0	83.1	81.0	84.4	81.8	7282	83.1
2010	8297.0	1127	82.8	81.1	82.8	81.1	84.0	81.9	7299	83.3
2011	2104.7	1127	20.9	78.1	20.9	78.1	21.3	78.9	1834	20.9
2012	4925.7	1127	48.8	76.7	48.8	76.7	49.8	77.5	4325	49.2

2013	6779.3	1127	67.1	76.3	66.7	76.2	68.7	77.1	5879	67.1
2014	0.0	1127	0.0	73.0	0.0	72.9	0.0	73.8	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1993 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					491	
C. Inspection, maintenance or repair combined with refuelling				993		
F. Major back-fitting, refurbishment or upgrading activities with refuelling	8760			130		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				415		
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					41	
Subtotal	8760	0	0	1538	532	0
Total	8760			2070		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1993 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		254
13. Reactor Auxiliary Systems		23
15. Reactor Cooling Systems		214
Total	0	491

# JP-51 OHI-4

Operator: KEPCO (Kansai Electric Power Co.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1127.0 MW(e)  
 Design Net Capacity: 1127.0 MW(e)  
 Design Discharge Burnup: 44000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(13/9/15-) IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

## 5. Historical Summary

Date of Construction Start: 13 Jun 1988      Lifetime Generation: 169174.0 GW(e)·h  
 Date of First Criticality: 28 May 1992      Cumulative Energy Availability Factor: 77.0%  
 Date of Grid Connection: 19 Jun 1992      Cumulative Load Factor: 78.1%  
 Date of Commercial Operation: 02 Feb 1993      Cumulative Unit Capability Factor: 77.0%  
    Cumulative Energy Unavailability Factor: 23.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1993	9079.7	1127	100.0	100.0	100.0	100.0	100.5	100.5	8016	100.0
1994	7851.5	1127	79.7	89.4	79.7	89.4	79.5	89.6	7063	80.6
1995	7495.1	1127	75.6	84.7	75.6	84.7	75.9	84.9	6695	76.4
1996	7051.1	1127	70.8	81.1	70.8	81.1	71.2	81.4	6221	70.8
1997	7660.2	1127	77.1	80.3	77.1	80.3	77.6	80.6	6756	77.1
1998	8839.4	1127	89.0	81.8	89.0	81.8	89.5	82.1	7835	89.4
1999	8903.4	1127	89.9	82.9	89.5	82.9	90.2	83.3	7872	89.9
2000	8649.8	1127	86.8	83.4	86.8	83.4	87.4	83.8	7629	86.9
2001	9283.6	1127	93.4	84.5	93.4	84.5	94.0	84.9	8179	93.4
2002	9217.1	1127	91.5	85.2	91.5	85.2	93.4	85.8	8017	91.5
2003	8762.6	1127	86.3	85.3	86.3	85.3	88.8	86.1	7557	86.3
2004	8318.2	1127	81.8	85.0	81.8	85.0	84.0	85.9	7186	81.8
2005	9929.0	1127	98.8	86.1	98.8	86.1	100.6	87.0	8657	98.8
2006	8163.9	1127	80.7	85.7	80.7	85.7	82.7	86.7	7087	80.9
2007	7978.6	1127	78.9	85.3	78.9	85.2	80.8	86.3	6934	79.2
2008	7642.7	1127	75.4	84.6	75.4	84.6	77.2	85.8	6654	75.8
2009	10097.4	1127	100.0	85.5	100.0	85.5	102.3	86.7	8760	100.0
2010	6977.3	1127	69.4	84.6	69.4	84.6	70.7	85.8	6109	69.7
2011	5599.9	1127	55.6	83.1	55.6	83.1	56.7	84.3	4872	55.6
2012	4486.6	1127	44.4	81.2	44.4	81.1	45.3	82.3	3941	44.9
2013	7167.7	1127	70.7	80.7	70.7	80.6	72.6	81.9	6191	70.7
2014	0.0	1127	0.0	77.0	0.0	77.0	0.0	78.1	0	0.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1994 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					155	
C. Inspection, maintenance or repair combined with refuelling				1058		
F. Major back-fitting, refurbishment or upgrading activities with refuelling	8760			122		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				309		
Z. Other					27	
Subtotal	8760	0	0	1489	182	0
Total	8760			1671		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1994 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
41. Main Generator Systems		152
Total	0	154

# JP-22 ONAGAWA-1

**Operator:** TOHOKU (Tohoku Electric Power Co., Inc)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 498.0 MW(e)  
**Design Net Capacity:** 496.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

IMPLEMENTATION OF SAFETY MEASURES FOR CONSIDERING THE NEW REGULATORY REQUIREMENTS.

## 5. Historical Summary

**Date of Construction Start:** 08 Jul 1980 **Lifetime Generation:** 81765.0 GW(e)·h  
**Date of First Criticality:** 18 Oct 1983 **Cumulative Energy Availability Factor:** 58.8%  
**Date of Grid Connection:** 18 Nov 1983 **Cumulative Load Factor:** 59.0%  
**Date of Commercial Operation:** 01 Jun 1984 **Cumulative Unit Capability Factor:** 61.9%  
**Cumulative Energy Unavailability Factor:** 41.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	2519.8	496	98.9	98.9	98.9	98.9	98.9	98.9	5136	100.0
1985	3259.2	496	75.6	84.2	75.6	84.2	75.0	83.8	6681	76.3
1986	3366.6	496	77.9	81.8	77.9	81.8	77.5	81.4	6871	78.4
1987	3161.7	497	72.8	79.3	72.8	79.3	72.6	78.9	6500	74.2
1988	3410.6	496	78.6	79.1	78.6	79.1	78.3	78.8	6949	79.1
1989	3013.7	497	69.1	77.3	69.1	77.3	69.2	77.1	6177	70.5
1990	2850.7	497	65.6	75.5	65.6	75.5	65.5	75.3	5908	67.4
1991	3345.9	497	77.0	75.7	77.0	75.7	76.9	75.5	6954	79.4
1992	4120.5	497	94.7	78.0	94.7	77.9	94.4	77.7	8342	95.0
1993	2300.1	497	52.0	75.2	50.6	75.1	52.8	75.1	4666	53.3
1994	3428.8	497	78.7	75.6	78.6	75.4	78.8	75.5	6961	79.5
1995	2936.4	497	68.2	74.9	67.8	74.8	67.4	74.8	6000	68.5
1996	3727.2	498	85.6	75.8	85.6	75.6	85.2	75.6	7523	85.6
1997	3304.6	498	76.2	75.8	76.2	75.7	75.8	75.6	6708	76.6
1998	3359.5	498	76.9	75.9	76.9	75.8	77.0	75.7	6841	78.1
1999	4240.2	498	97.2	77.3	97.2	77.1	97.2	77.1	8517	97.2
2000	3689.1	498	84.6	77.7	84.6	77.6	84.3	77.5	7436	84.7
2001	3425.1	498	78.5	77.8	78.4	77.6	78.5	77.6	6873	78.5
2002	3143.2	498	68.5	77.3	68.5	77.1	72.1	77.3	6001	68.5
2003	1856.1	498	42.5	75.5	42.5	75.4	42.5	75.5	3725	42.5
2004	2998.9	498	68.6	75.1	68.5	75.0	68.6	75.2	6020	68.5
2005	1898.6	498	80.8	75.4	43.1	73.6	43.5	73.7	3799	43.4
2006	0.0	498	4.8	72.3	0.0	70.3	0.0	70.4	0	0.0

2007	2162.2	498	49.3	71.3	49.3	69.4	49.6	69.6	4351	49.7
2008	530.8	498	12.0	68.9	12.0	67.1	12.1	67.2	1057	12.0
2009	3117.3	498	71.3	69.0	71.3	67.2	71.5	67.4	6531	74.6
2010	2661.1	498	60.2	68.6	60.2	67.0	61.0	67.1	5338	60.9
2011	851.4	498	69.0	68.7	19.1	65.2	19.5	65.4	1671	19.1
2012	0.0	498	0.0	66.2	0.0	62.9	0.0	63.1	0	0.0
2013	0.0	498	0.0	64.0	0.0	60.8	0.0	61.0	0	0.0
2014	0.0	498	0.0	61.9	0.0	58.8	0.0	59.0	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					331	
C. Inspection, maintenance or repair combined with refuelling				1511	71	
D. Inspection, maintenance or repair without refuelling				212		
E. Testing of plant systems or components					324	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			612		
L. Human factor related					3	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						273
Subtotal	8760	0	0	2335	729	273
Total		8760			3337	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
14. Safety Systems		81
15. Reactor Cooling Systems		162
31. Turbine and auxiliaries		24
32. Feedwater and Main Steam System		49
41. Main Generator Systems		9
42. Electrical Power Supply Systems		4
Total	0	329

## JP-54 ONAGAWA-2

Operator: TOHOKU (Tohoku Electric Power Co., Inc)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 796.0 MW(e)

Design Net Capacity: 796.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF SAFETY MEASURES FOR CONSIDERING THE NEW REGULATORY REQUIREMENTS.

### 5. Historical Summary

Date of Construction Start: 12 Apr 1991      Lifetime Generation: 81165.0 GW(e)·h

Date of First Criticality: 02 Nov 1994      Cumulative Energy Availability Factor: 58.8%

Date of Grid Connection: 23 Dec 1994      Cumulative Load Factor: 58.9%

Date of Commercial Operation: 28 Jul 1995      Cumulative Unit Capability Factor: 63.3%

Cumulative Energy Unavailability Factor: 41.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1995	3261.4	796	93.4	93.4	93.4	93.4	92.8	92.8	4149	94.0
1996	5175.3	796	74.4	80.8	74.4	80.8	74.0	80.3	6545	74.5
1997	6931.6	796	99.9	88.4	99.9	88.4	99.4	87.9	8760	100.0
1998	5647.7	796	81.1	86.3	81.1	86.3	81.0	85.9	7185	82.0
1999	5841.2	796	84.2	85.9	84.2	85.9	83.8	85.5	7383	84.3
2000	5858.6	796	84.2	85.6	84.2	85.6	83.8	85.2	7402	84.3
2001	6521.2	796	94.0	86.9	94.0	86.9	93.5	86.4	8238	94.0
2002	5242.9	796	72.4	84.9	72.4	84.9	75.2	84.9	6368	72.7
2003	3272.4	796	47.3	80.5	47.2	80.5	46.9	80.5	4139	47.2
2004	7040.4	796	100.0	82.6	100.0	82.6	100.7	82.6	8784	100.0
2005	1877.3	796	64.5	80.8	26.8	77.2	26.9	77.3	2367	27.0
2006	2484.7	796	38.9	77.2	35.6	73.6	35.6	73.7	3188	36.4
2007	5184.6	796	73.8	76.9	73.8	73.6	74.4	73.7	6491	74.1
2008	6453.4	796	91.8	78.0	91.8	75.0	92.3	75.1	8086	92.1
2009	3430.3	796	49.0	76.0	49.0	73.2	49.2	73.3	4330	49.4
2010	5905.5	796	84.6	76.6	84.4	73.9	84.7	74.1	7417	84.7
2011	0.0	796	47.0	74.8	0.0	69.4	0.0	69.6	0	0.0
2012	0.0	796	0.0	70.5	0.0	65.5	0.0	65.6	0	0.0
2013	0.0	796	0.0	66.7	0.0	61.9	0.0	62.1	0	0.0
2014	0.0	796	0.0	63.3	0.0	58.8	0.0	58.9	0	0.0

### 6. Full Outages, Analysis by Cause

	2014 Hours Lost	1995 to 2014
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Outage Cause	2014 Hours Lost			Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					469	
C. Inspection, maintenance or repair combined with refuelling				1143	5	
D. Inspection, maintenance or repair without refuelling				31		
E. Testing of plant systems or components					9	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			1026		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						385
Subtotal	8760	0	0	2200	483	385
Total	8760			3068		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1995 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		39
12. Reactor I&C Systems		92
13. Reactor Auxiliary Systems		79
15. Reactor Cooling Systems		203
31. Turbine and auxiliaries		17
32. Feedwater and Main Steam System		38
Total	0	468

## JP-57 ONAGAWA-3

Operator: TOHOKU (Tohoku Electric Power Co., Inc)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 796.0 MW(e)

Design Net Capacity: 796.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF SAFETY MEASURES FOR CONSIDERING THE NEW REGULATORY REQUIREMENTS.

### 5. Historical Summary

Date of Construction Start: 23 Jan 1998      Lifetime Generation: 43740.0 GW(e)·h

Date of First Criticality: 26 Apr 2001      Cumulative Energy Availability Factor: 47.7%

Date of Grid Connection: 30 May 2001      Cumulative Load Factor: 48.5%

Date of Commercial Operation: 30 Jan 2002      Cumulative Unit Capability Factor: 52.5%

Cumulative Energy Unavailability Factor: 52.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2002	6652.5	796	100.0	100.0	100.0	100.0	95.4	95.4	8064	92.1
2003	5978.2	796	84.7	92.3	83.7	91.9	85.7	90.6	7332	83.7
2004	5348.7	796	74.6	86.4	74.4	86.0	76.5	85.9	6548	74.5
2005	4381.8	796	72.7	83.0	61.2	79.8	62.8	80.1	5460	62.3
2006	2798.1	796	39.0	74.2	39.0	71.7	40.1	72.1	3476	39.7
2007	2261.4	796	31.7	67.1	31.7	65.0	32.4	65.5	2887	33.0
2008	6502.2	796	90.1	70.4	90.1	68.6	93.0	69.4	7921	90.2
2009	3405.8	796	47.5	67.5	47.5	66.0	48.8	66.9	4202	48.0
2010	5342.8	796	74.2	68.3	74.2	66.9	76.6	68.0	6540	74.7
2011	1315.9	796	68.3	68.3	18.4	62.0	18.9	63.0	1671	19.1
2012	0.0	796	0.0	62.1	0.0	56.4	0.0	57.3	0	0.0
2013	0.0	796	0.0	56.9	0.0	51.7	0.0	52.5	0	0.0
2014	0.0	796	0.0	52.5	0.0	47.7	0.0	48.5	0	0.0

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2003 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					184	
C. Inspection, maintenance or repair combined with refuelling				1117	162	
E. Testing of plant systems or components					368	
F. Major back-fitting, refurbishment or				226		

upgrading activities with refuelling						
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			1462		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						455
Z. Other					232	
Subtotal	8760	0	0	2805	946	455
Total	8760			4206		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2003 to 2014 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		47
31. Turbine and auxiliaries		37
32. Feedwater and Main Steam System		99
Total	0	183

**JP-28 SENDAI-1****Operator:** KYUSHU (Kyushu Electric Power Co.,Inc.)**Contractor:** MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 846.0 MW(e)

**Design Net Capacity:** 846.0 MW(e)

**Design Discharge Burnup:** 49000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 0.0 GW(e)·h

**Energy Availability Factor:** 0.0%

**Load Factor:** 0.0%

**Operating Factor:** 0.0%

**Energy Unavailability Factor:** 100.0%

**Total Off-line Time:** 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>PUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 15 Dec 1979      **Lifetime Generation:** 172760.0 GW(e)·h

**Date of First Criticality:** 25 Aug 1983      **Cumulative Energy Availability Factor:** 72.2%

**Date of Grid Connection:** 16 Sep 1983      **Cumulative Load Factor:** 73.7%

**Date of Commercial Operation:** 04 Jul 1984      **Cumulative Unit Capability Factor:** 72.2%

**Cumulative Energy Unavailability Factor:** 27.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	3775.4	846	100.0	100.0	100.0	100.0	101.1	101.1	4416	100.0
1985	5890.3	846	78.7	85.8	78.7	85.8	79.5	86.7	6964	79.5
1986	6084.0	846	81.4	84.0	81.4	84.0	82.1	84.9	7224	82.5
1987	6113.4	846	81.7	83.4	81.7	83.4	82.5	84.2	7261	82.9
1988	5683.1	846	75.8	81.7	75.8	81.7	76.5	82.5	6756	76.9
1989	7381.3	846	98.7	84.8	98.7	84.8	99.6	85.6	8641	98.6
1990	6155.0	846	82.3	84.4	82.3	84.4	83.1	85.2	7307	83.4
1991	5590.7	846	74.8	83.1	74.8	83.1	75.4	83.9	6684	76.3
1992	5713.9	846	76.1	82.3	76.1	82.3	76.9	83.1	6780	77.2
1993	6619.2	846	88.4	82.9	88.4	82.9	89.3	83.7	7753	88.5
1994	5778.3	846	77.2	82.4	77.2	82.4	78.0	83.2	6762	77.2
1995	5780.3	846	77.3	81.9	77.3	81.9	78.0	82.7	6863	78.3
1996	5185.4	846	69.1	80.9	69.1	80.9	69.8	81.7	6157	70.1
1997	7216.7	846	96.4	82.1	96.4	82.1	97.4	82.9	8449	96.4
1998	5291.2	846	70.6	81.3	70.6	81.3	71.4	82.1	6311	72.0
1999	6057.6	846	80.8	81.2	80.8	81.2	81.7	82.0	7082	80.8
2000	5654.0	846	75.2	80.9	75.2	80.9	76.1	81.7	6609	75.2
2001	7367.0	846	98.3	81.9	98.3	81.9	99.4	82.7	8614	98.3
2002	6323.0	846	83.7	82.0	83.7	82.0	85.3	82.8	7333	83.7
2003	6282.1	846	83.1	82.0	83.1	82.0	84.8	82.9	7278	83.1
2004	6080.8	846	80.1	81.9	80.1	81.9	81.8	82.9	7043	80.2
2005	7155.8	846	94.7	82.5	94.7	82.5	96.6	83.5	8305	94.8
2006	6436.6	846	82.9	82.5	82.9	82.5	86.9	83.7	7330	83.7
2007	5868.9	846	75.2	82.2	75.2	82.2	79.2	83.5	6660	76.0



2008	5665.1	846	71.9	81.8	71.9	81.8	76.2	83.2	6396	72.8
2009	7880.1	846	100.0	82.5	100.0	82.5	106.3	84.1	8760	100.0
2010	4919.6	846	62.7	81.8	62.7	81.8	66.4	83.4	5571	63.6
2011	2823.8	846	35.3	80.1	35.3	80.1	38.1	81.8	3097	35.4
2012	0.0	846	0.0	77.3	0.0	77.3	0.0	78.9	0	0.0
2013	0.0	846	0.0	74.7	0.0	74.7	0.0	76.2	0	0.0
2014	0.0	846	0.0	72.2	0.0	72.2	0.0	73.7	0	0.0

#### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					61	
C. Inspection, maintenance or repair combined with refuelling				1384		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			716		
Subtotal	8760	0	0	2100	61	0
Total	8760			2161		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		8
16. Steam generation systems		22
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		21
Total	0	59

**JP-37 SENDAI-2****Operator:** KYUSHU (Kyushu Electric Power Co.,Inc.)**Contractor:** MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 846.0 MW(e)

**Design Net Capacity:** 846.0 MW(e)

**Design Discharge Burnup:** 49000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 0.0 GW(e)·h

**Energy Availability Factor:** 0.0%

**Load Factor:** 0.0%

**Operating Factor:** 0.0%

**Energy Unavailability Factor:** 100.0%

**Total Off-line Time:** 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>PUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 12 Oct 1981 **Lifetime Generation:** 161170.0 GW(e)·h

**Date of First Criticality:** 18 Mar 1985 **Cumulative Energy Availability Factor:** 74.1%

**Date of Grid Connection:** 05 Apr 1985 **Cumulative Load Factor:** 75.4%

**Date of Commercial Operation:** 28 Nov 1985 **Cumulative Unit Capability Factor:** 74.1%

**Cumulative Energy Unavailability Factor:** 25.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	1252.9	846	100.0	100.0	100.0	100.0	101.2	101.2	1464	100.0
1986	5996.4	846	80.1	83.0	80.1	83.0	80.9	83.8	7112	81.2
1987	6080.6	846	81.2	82.2	81.2	82.2	82.0	83.0	7211	82.3
1988	7409.8	846	98.7	87.4	98.7	87.4	99.7	88.3	8665	98.6
1989	4999.4	846	66.8	82.5	66.8	82.5	67.5	83.3	5950	67.9
1990	6160.1	846	82.4	82.4	82.4	82.4	83.1	83.3	7309	83.4
1991	5665.3	846	75.7	81.4	75.7	81.4	76.4	82.2	6732	76.8
1992	7385.3	846	98.3	83.7	98.3	83.7	99.4	84.6	8639	98.3
1993	5822.0	846	77.7	83.0	77.7	83.0	78.6	83.8	6632	75.7
1994	5568.8	846	74.3	82.0	74.3	82.0	75.1	82.9	6557	74.9
1995	5658.4	846	75.5	81.4	75.5	81.4	76.4	82.2	6709	76.6
1996	7359.3	846	98.0	82.9	98.0	82.9	99.0	83.7	8617	98.1
1997	5950.3	846	79.4	82.6	79.4	82.6	80.3	83.5	7034	80.3
1998	5899.1	846	78.7	82.3	78.7	82.3	79.6	83.2	6973	79.6
1999	5658.3	846	75.5	81.8	75.5	81.8	76.4	82.7	6612	75.5
2000	7370.2	846	98.0	82.9	98.0	82.9	99.2	83.8	8614	98.1
2001	6210.2	846	82.9	82.9	82.9	82.9	83.8	83.8	7260	82.9
2002	6255.5	846	82.8	82.9	82.8	82.9	84.4	83.8	7257	82.8
2003	6348.8	846	83.4	82.9	83.4	82.9	85.7	83.9	7315	83.5
2004	6762.5	846	88.5	83.2	88.5	83.2	91.0	84.3	7774	88.5
2005	6752.8	846	88.9	83.5	88.9	83.5	91.1	84.6	7895	90.1
2006	6464.2	846	85.3	83.6	85.3	83.6	87.2	84.7	7548	86.2
2007	5989.3	846	79.0	83.4	79.0	83.4	80.8	84.6	6996	79.9
2008	6824.3	846	89.9	83.7	89.9	83.7	91.8	84.9	7897	89.9

2009	6320.2	846	83.2	83.6	83.2	83.6	85.3	84.9	7355	84.0
2010	5767.5	846	74.8	83.3	74.8	83.3	77.8	84.6	6630	75.7
2011	5216.8	846	66.5	82.6	66.5	82.6	70.4	84.1	5833	66.6
2012	0.0	846	0.0	79.6	0.0	79.6	0.0	81.0	0	0.0
2013	0.0	846	0.0	76.8	0.0	76.8	0.0	78.1	0	0.0
2014	0.0	846	0.0	74.1	0.0	74.1	0.0	75.4	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					4	
C. Inspection, maintenance or repair combined with refuelling				1331		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			634		
Subtotal	8760	0	0	1965	4	0
Total	8760			1969		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
32. Feedwater and Main Steam System		4
Total	0	4

**JP-48 SHIKA-1****Operator:** HOKURIKU (HOKURIKU ELECTRIC POWER CO.)**Contractor:** HITACHI (HITACHI LTD.)**1. Station Details**

**Type:** BWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 505.0 MW(e)

**Design Net Capacity:** 505.0 MW(e)

**Design Discharge Burnup:** 45000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 0.0 GW(e)·h

**Energy Availability Factor:** 0.0%

**Load Factor:** 0.0%

**Operating Factor:** 0.0%

**Energy Unavailability Factor:** 100.0%

**Total Off-line Time:** 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EUUF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>PUF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA  
DAI-ICHI AND DAI-NI NUCLEAR POWER STATIONS

**5. Historical Summary**

**Date of Construction Start:** 01 Jul 1989 **Lifetime Generation:** 56344.0 GW(e)·h

**Date of First Criticality:** 20 Nov 1992 **Cumulative Energy Availability Factor:** 58.6%

**Date of Grid Connection:** 12 Jan 1993 **Cumulative Load Factor:** 58.4%

**Date of Commercial Operation:** 30 Jul 1993 **Cumulative Unit Capability Factor:** 58.6%

**Cumulative Energy Unavailability Factor:** 41.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1993	2068.5	505	99.8	99.8	99.8	99.8	92.8	92.8	4130	93.5
1994	3312.4	505	75.0	83.3	75.0	83.3	74.9	80.9	6584	75.2
1995	3497.2	505	79.0	81.6	79.0	81.6	79.1	80.1	6974	79.6
1996	3454.7	505	77.9	80.6	77.9	80.6	77.9	79.5	6848	78.0
1997	4431.8	505	100.0	84.9	100.0	84.9	100.2	84.1	8760	100.0
1998	3530.6	505	80.0	84.0	80.0	84.0	79.8	83.3	7047	80.4
1999	3325.7	505	75.4	82.7	75.4	82.7	75.2	82.1	6607	75.4
2000	3763.1	505	84.9	83.0	84.9	83.0	84.8	82.4	7462	84.9
2001	4427.4	505	100.0	85.0	100.0	85.0	100.1	84.5	8760	100.0
2002	3537.1	505	80.0	84.4	80.0	84.4	80.0	84.0	7010	80.0
2003	1523.8	505	34.6	79.7	34.6	79.7	34.4	79.3	3029	34.6
2004	3534.9	505	78.8	79.6	78.8	79.6	79.7	79.3	6958	79.2
2005	4203.8	505	100.0	81.2	100.0	81.2	95.0	80.6	8226	93.9
2006	2908.1	505	65.3	80.1	65.3	80.1	65.7	79.5	5777	65.9
2007	908.4	505	20.2	75.9	20.2	75.9	20.5	75.4	1778	20.3
2008	0.0	505	0.0	71.0	0.0	71.0	0.0	70.6	0	0.0
2009	3247.9	505	72.3	71.1	72.3	71.1	73.4	70.7	6367	72.7
2010	3191.6	505	71.1	71.1	71.1	71.1	72.1	70.8	6287	71.8
2011	729.6	505	16.1	68.1	16.1	68.1	16.5	67.9	1416	16.2
2012	0.0	505	0.0	64.6	0.0	64.6	0.0	64.4	0	0.0
2013	0.0	505	0.0	61.5	0.0	61.5	0.0	61.3	0	0.0
2014	0.0	505	0.0	58.6	0.0	58.6	0.0	58.4	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1994 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					366	
C. Inspection, maintenance or repair combined with refuelling				1525		
D. Inspection, maintenance or repair without refuelling				418		
E. Testing of plant systems or components				98		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			842		
H. Nuclear regulatory requirements					32	
J. Grid limitation, failure or grid unavailability						29
Subtotal	8760	0	0	2883	398	29
Total	8760			3310		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1994 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		12
15. Reactor Cooling Systems		311
31. Turbine and auxiliaries		7
41. Main Generator Systems		20
42. Electrical Power Supply Systems		14
Total	0	364

**JP-59 SHIKA-2**

Operator: HOKURIKU (HOKURIKU ELECTRIC POWER CO.)

Contractor: HITACHI (HITACHI LTD.)

**1. Station Details**

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1108.0 MW(e)

Design Net Capacity: 1304.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA  
DAI-ICHI AND DAI-NI NUCLEAR POWER STATIONS

**5. Historical Summary**

Date of Construction Start: 20 Aug 2001      Lifetime Generation: 29296.0 GW(e)·h

Date of First Criticality: 26 May 2005      Cumulative Energy Availability Factor: 28.7%

Date of Grid Connection: 04 Jul 2005      Cumulative Load Factor: 29.7%

Date of Commercial Operation: 15 Mar 2006      Cumulative Unit Capability Factor: 28.7%

   Cumulative Energy Unavailability Factor: 71.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2006	3953.9	1304	41.1	41.1	41.1	41.1	41.3	41.3	3030	41.3
2007	0.0	1304	0.0	18.8	0.0	18.8	0.0	18.8	0	0.0
2008	6381.9	1108	58.5	32.0	58.5	32.0	61.1	32.9	5610	63.9
2009	5647.1	1108	55.9	37.6	55.9	37.6	58.2	38.8	5044	57.6
2010	9279.2	1108	91.5	47.9	91.5	47.9	95.6	49.7	8038	91.8
2011	1408.1	1108	14.0	42.5	14.0	42.5	14.5	44.0	1263	14.4
2012	0.0	1108	0.0	36.6	0.0	36.6	0.0	37.9	0	0.0
2013	0.0	1108	0.0	32.2	0.0	32.2	0.0	33.3	0	0.0
2014	0.0	1108	0.0	28.7	0.0	28.7	0.0	29.7	0	0.0

**6. Full Outages, Analysis by Cause**

Outage Cause	2014 Hours Lost			2006 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					358	
C. Inspection, maintenance or repair combined with refuelling				787		
E. Testing of plant systems or components				100		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			2477		
H. Nuclear regulatory requirements					1452	
L. Human factor related					2	

Subtotal	8760	0	0	3364	1812	0
Total	8760			5176		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2006 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		43
31. Turbine and auxiliaries		104
42. Electrical Power Supply Systems		210
Total	0	357

## JP-7 SHIMANE-1

Operator: CHUGOKU (THE CHUGOKU ELECTRIC POWER CO.,INC.)

Contractor: HITACHI (HITACHI LTD.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 439.0 MW(e)  
 Design Net Capacity: 439.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA  
 DAI-ICHI AND DAI-NI NUCLEAR POWER STATIONS

### 5. Historical Summary

Date of Construction Start: 02 Jul 1970      Lifetime Generation: 101877.0 GW(e)·h  
 Date of First Criticality: 01 Jun 1973      Cumulative Energy Availability Factor: 64.4%  
 Date of Grid Connection: 02 Dec 1973      Cumulative Load Factor: 64.6%  
 Date of Commercial Operation: 29 Mar 1974      Cumulative Unit Capability Factor: 64.6%  
    Cumulative Energy Unavailability Factor: 35.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	2756.2	440	84.0	84.0	84.0	84.0	85.3	85.3	6387	87.0
1975	2946.1	439	78.7	81.1	78.7	81.1	76.6	80.6	7010	80.0
1976	2802.9	439	72.7	78.2	72.7	78.2	72.7	77.8	6697	76.2
1977	1879.1	439	48.9	70.6	48.9	70.6	48.9	70.3	4489	51.2
1978	2701.8	439	70.3	70.5	70.3	70.5	70.3	70.3	6394	73.0
1979	2623.6	439	68.4	70.1	68.4	70.1	68.2	69.9	6341	72.4
1980	2734.6	439	70.9	70.2	70.9	70.2	70.9	70.1	6466	73.6
1981	2293.1	439	57.0	68.5	57.0	68.5	59.6	68.7	5430	62.0
1982	2366.8	439	61.5	67.7	61.5	67.7	61.5	67.9	5499	62.8
1983	2696.1	439	70.1	68.0	70.1	68.0	70.1	68.1	6268	71.6
1984	2990.7	439	78.2	68.9	78.2	68.9	77.6	69.0	6912	78.7
1985	3790.4	439	100.0	71.6	99.1	71.5	98.6	71.5	8705	99.4
1986	2130.5	439	55.5	70.3	55.5	70.2	55.4	70.3	4903	56.0
1987	3011.2	439	79.4	71.0	78.6	70.8	78.3	70.8	6937	79.2
1988	2355.1	439	61.1	70.3	61.1	70.2	61.1	70.2	5398	61.5
1989	2616.3	439	68.1	70.2	68.1	70.0	68.0	70.0	5965	68.1
1990	3745.5	439	97.4	71.8	97.4	71.7	97.4	71.7	8565	97.8
1991	3111.3	439	80.9	72.3	80.9	72.2	80.9	72.2	7123	81.3
1992	2671.3	439	73.4	72.3	69.4	72.0	69.3	72.0	6134	69.8
1993	2549.1	439	66.5	72.0	66.5	71.7	66.3	71.7	5849	66.8
1994	2948.0	439	76.7	72.3	76.7	72.0	76.7	72.0	6733	76.9
1995	2984.6	439	78.1	72.5	78.1	72.3	77.6	72.2	6862	78.3



1996	2245.5	439	58.4	71.9	58.4	71.7	58.2	71.6	5154	58.7
1997	2923.6	439	76.2	72.1	76.2	71.8	76.0	71.8	6712	76.6
1998	3845.4	439	100.0	73.2	100.0	73.0	100.0	72.9	8760	100.0
1999	3359.3	439	87.4	73.8	87.4	73.5	87.4	73.5	7657	87.4
2000	1381.2	439	35.8	72.3	35.8	72.1	35.8	72.1	3149	35.8
2001	2844.6	439	74.1	72.4	74.1	72.2	74.0	72.2	6488	74.1
2002	3393.2	439	88.2	73.0	88.2	72.8	88.2	72.7	7730	88.2
2003	2749.0	439	71.4	72.9	71.4	72.7	71.5	72.7	6253	71.4
2004	3937.9	439	100.0	73.8	100.0	73.6	102.1	73.6	8784	100.0
2005	2382.3	439	60.8	73.4	60.8	73.2	61.9	73.3	5349	61.1
2006	2699.5	439	68.7	73.2	68.7	73.1	70.2	73.2	6025	68.8
2007	2866.6	439	73.4	73.2	73.4	73.1	74.5	73.2	6441	73.5
2008	2738.4	439	69.7	73.1	69.7	73.0	71.0	73.1	6142	69.9
2009	2533.2	439	64.4	72.9	64.4	72.7	65.9	72.9	5667	64.7
2010	969.9	439	24.5	71.6	24.5	71.4	25.2	71.6	2151	24.6
2011	0.0	439	0.0	69.7	0.0	69.5	0.0	69.8	0	0.0
2012	0.0	439	0.0	67.9	0.0	67.7	0.0	68.0	0	0.0
2013	0.0	439	0.0	66.2	0.0	66.0	0.0	66.3	0	0.0
2014	0.0	439	0.0	64.6	0.0	64.4	0.0	64.6	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					96	
C. Inspection, maintenance or repair combined with refuelling				1988		
D. Inspection, maintenance or repair without refuelling				60		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			529		
H. Nuclear regulatory requirements					129	
J. Grid limitation, failure or grid unavailability						1
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other					17	
Subtotal	8760	0	0	2577	242	2
Total	8760			2821		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
14. Safety Systems		3
15. Reactor Cooling Systems		61
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		29
Total	0	94

## JP-41 SHIMANE-2

Operator: CHUGOKU (THE CHUGOKU ELECTRIC POWER CO.,INC.)

Contractor: HITACHI (HITACHI LTD.)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 789.0 MW(e)

Design Net Capacity: 789.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA  
DAI-ICHI AND DAI-NI NUCLEAR POWER STATIONS

### 5. Historical Summary

Date of Construction Start: 02 Feb 1985      Lifetime Generation: 129177.0 GW(e)·h

Date of First Criticality: 25 May 1988      Cumulative Energy Availability Factor: 71.2%

Date of Grid Connection: 11 Jul 1988      Cumulative Load Factor: 71.1%

Date of Commercial Operation: 10 Feb 1989      Cumulative Unit Capability Factor: 71.2%

   Cumulative Energy Unavailability Factor: 28.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	5628.8	790	89.2	89.2	89.2	89.2	88.8	88.8	7179	89.6
1990	5123.5	790	74.0	81.3	74.0	81.3	74.0	81.1	6592	75.3
1991	5544.5	790	80.1	80.9	80.1	80.9	80.1	80.8	7121	81.3
1992	5516.1	790	79.7	80.6	79.7	80.6	79.5	80.4	7072	80.5
1993	6756.9	790	97.8	84.1	97.8	84.1	97.6	83.9	8592	98.1
1994	5547.3	790	80.6	83.5	80.6	83.5	80.2	83.3	7071	80.7
1995	5363.6	790	77.9	82.7	77.9	82.7	77.5	82.5	6888	78.6
1996	5583.7	790	80.8	82.4	80.8	82.4	80.5	82.2	7166	81.6
1997	6903.2	789	100.0	84.4	100.0	84.4	99.9	84.2	8760	100.0
1998	5962.5	789	86.5	84.6	86.5	84.6	86.3	84.4	7600	86.8
1999	5758.7	789	83.5	84.5	83.5	84.5	83.3	84.3	7319	83.6
2000	6084.0	789	88.2	84.8	88.1	84.8	87.8	84.6	7747	88.2
2001	6901.0	789	100.0	86.0	100.0	86.0	99.8	85.8	8760	100.0
2002	6055.1	789	87.6	86.1	87.6	86.1	87.6	85.9	7678	87.6
2003	4836.2	789	70.1	85.0	70.0	85.0	70.0	84.8	6133	70.0
2004	4097.6	789	59.0	83.4	59.0	83.4	59.1	83.2	5202	59.2
2005	5907.5	789	85.6	83.5	85.4	83.5	85.5	83.3	7544	86.1
2006	5085.4	789	73.6	83.0	73.6	82.9	73.6	82.8	6469	73.8
2007	5462.0	789	79.5	82.8	79.5	82.8	79.0	82.6	6970	79.6
2008	4703.6	789	68.3	82.1	68.3	82.0	67.9	81.9	6001	68.3
2009	5373.8	789	77.5	81.8	77.5	81.8	77.8	81.7	6799	77.6
2010	1924.4	789	27.6	79.4	27.6	79.3	27.8	79.2	2438	27.8

2011	6922.0	789	100.0	80.3	100.0	80.2	100.1	80.1	8760	100.0
2012	491.7	789	7.1	77.2	7.1	77.2	7.1	77.1	625	7.1
2013	0.0	789	0.0	74.1	0.0	74.1	0.0	74.0	0	0.0
2014	0.0	789	0.0	71.2	0.0	71.2	0.0	71.1	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					116	
C. Inspection, maintenance or repair combined with refuelling				1221	5	
D. Inspection, maintenance or repair without refuelling				4		
F. Major back-fitting, refurbishment or upgrading activities with refuelling	8760			650		
H. Nuclear regulatory requirements					133	
L. Human factor related					4	
Z. Other					22	
Subtotal	8760	0	0	1875	280	0
Total	8760			2155		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		36
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		13
15. Reactor Cooling Systems		61
Total	0	114

# JP-8 TAKAHAMA-1

**Operator:** KEPCO (Kansai Electric Power Co.)

**Contractor:** WH/MHI (WESTINGHOUSE ELECTRIC CORPORATION / MITSUBISHI HEAVY INDUSTRIES LTD.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 780.0 MW(e)  
**Design Net Capacity:** 780.0 MW(e)  
**Design Discharge Burnup:** 43000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 0.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.0%  
**Total Off-line Time:** 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING STARTED ON 10 JANUARY 2011. ORIGINAL END OF REFUELLING OUTAGE WAS 2 APRIL 2011. THE OUTAGE CONTINUED WITH IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

## 5. Historical Summary

**Date of Construction Start:** 25 Apr 1970 **Lifetime Generation:** 174314.0 GW(e)·h  
**Date of First Criticality:** 14 Mar 1974 **Cumulative Energy Availability Factor:** 62.6%  
**Date of Grid Connection:** 27 Mar 1974 **Cumulative Load Factor:** 63.5%  
**Date of Commercial Operation:** 14 Nov 1974 **Cumulative Unit Capability Factor:** 62.6%  
**Cumulative Energy Unavailability Factor:** 37.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	1059.8	780	94.0	94.0	94.0	94.0	92.8	92.8	1376	94.0
1975	4980.4	780	72.8	75.9	72.8	75.9	72.9	75.7	6938	79.2
1976	3170.1	780	46.2	62.1	46.2	62.1	46.3	62.1	4900	55.8
1977	383.8	780	5.6	44.3	5.6	44.3	5.6	44.3	569	6.5
1978	2762.5	780	40.4	43.4	40.4	43.4	40.4	43.4	4088	46.7
1979	1648.9	780	24.1	39.7	24.1	39.7	24.1	39.6	2269	25.9
1980	2705.1	780	39.4	39.6	39.4	39.6	39.5	39.6	3604	41.0
1981	3990.2	780	58.3	42.2	58.3	42.2	58.4	42.2	5180	59.1
1982	3872.1	780	56.5	44.0	56.5	44.0	56.7	44.0	5085	58.0
1983	5716.2	780	83.7	48.3	83.7	48.3	83.7	48.3	7403	84.5
1984	3537.4	780	51.4	48.6	51.4	48.6	51.6	48.7	4586	52.2
1985	5000.8	780	72.8	50.8	72.8	50.8	73.2	50.8	6473	73.9
1986	5070.3	780	73.9	52.7	73.9	52.7	74.2	52.8	6507	74.3
1987	4701.4	780	70.2	54.0	70.2	54.0	68.8	54.0	6148	70.2
1988	4147.1	780	60.9	54.5	60.9	54.5	60.5	54.4	5351	60.9
1989	4877.3	780	72.0	55.6	72.0	55.6	71.4	55.6	6311	72.0
1990	6265.5	780	90.8	57.8	90.8	57.8	91.7	57.8	8002	91.3
1991	4795.0	780	68.2	58.4	68.2	58.4	70.2	58.5	6202	70.8
1992	4645.0	780	67.6	58.9	67.6	58.9	67.8	59.0	6051	68.9
1993	3299.7	780	48.4	58.4	48.4	58.4	48.3	58.5	4458	50.9
1994	4024.0	780	58.8	58.4	58.8	58.4	58.9	58.5	5146	58.7

1995	6585.1	780	96.0	60.2	96.0	60.2	96.4	60.3	8485	96.9
1996	3358.8	780	48.8	59.7	48.8	59.7	49.0	59.8	4331	49.3
1997	4674.4	780	68.1	60.0	68.1	60.0	68.4	60.1	6000	68.5
1998	6856.8	780	100.0	61.7	100.0	61.7	100.4	61.8	8760	100.0
1999	5704.2	780	84.3	62.6	83.2	62.5	83.5	62.7	7291	83.2
2000	6008.1	780	87.4	63.5	87.4	63.5	87.7	63.6	7716	87.8
2001	6005.8	780	87.6	64.4	87.6	64.4	87.9	64.5	7731	88.3
2002	6056.3	780	88.4	65.3	88.4	65.2	88.6	65.4	7749	88.5
2003	6247.2	780	87.2	66.0	87.2	66.0	91.4	66.3	7637	87.2
2004	5539.9	780	77.2	66.4	77.2	66.4	80.9	66.8	6785	77.2
2005	6222.5	780	87.1	67.1	87.1	67.0	91.1	67.5	7659	87.4
2006	6347.1	780	89.2	67.7	89.2	67.7	92.9	68.3	7811	89.2
2007	6012.9	780	84.2	68.2	84.2	68.2	88.0	68.9	7399	84.5
2008	4935.8	780	68.8	68.3	68.8	68.2	72.0	69.0	6077	69.2
2009	5870.1	780	81.7	68.6	81.7	68.6	85.9	69.5	7193	82.1
2010	7193.5	780	100.0	69.5	100.0	69.5	105.3	70.5	8760	100.0
2011	183.4	780	2.5	67.7	2.5	67.7	2.7	68.6	226	2.6
2012	0.0	780	0.0	65.9	0.0	65.9	0.0	66.8	0	0.0
2013	0.0	780	0.0	64.2	0.0	64.2	0.0	65.1	0	0.0
2014	0.0	780	0.0	62.6	0.0	62.6	0.0	63.5	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					334	
C. Inspection, maintenance or repair combined with refuelling				1758		
D. Inspection, maintenance or repair without refuelling				173		
E. Testing of plant systems or components				0		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				44		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			591		
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					1	
Z. Other					8	
Subtotal	8760	0	0	2566	343	2
Total	8760			2911		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		6
15. Reactor Cooling Systems		86
16. Steam generation systems		199
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		21
42. Electrical Power Supply Systems		0
Total	0	331

## JP-13 TAKAHAMA-2

Operator: KEPCO (Kansai Electric Power Co.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 780.0 MW(e)  
 Design Net Capacity: 780.0 MW(e)  
 Design Discharge Burnup: 43000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(11/11/25-) IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 09 Mar 1971      Lifetime Generation: 172658.0 GW(e)·h  
 Date of First Criticality: 20 Dec 1974      Cumulative Energy Availability Factor: 63.3%  
 Date of Grid Connection: 17 Jan 1975      Cumulative Load Factor: 64.5%  
 Date of Commercial Operation: 14 Nov 1975      Cumulative Unit Capability Factor: 63.4%  
    Cumulative Energy Unavailability Factor: 36.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	1147.0	780	99.5	99.5	99.5	99.5	100.4	100.4	1464	100.0
1976	3728.8	780	54.2	60.7	54.2	60.7	54.4	61.0	6214	70.7
1977	4742.0	780	69.4	64.7	69.4	64.7	69.4	64.9	6429	73.4
1978	4170.3	780	61.0	63.5	61.0	63.5	61.0	63.7	5751	65.7
1979	1281.0	780	18.7	52.8	18.7	52.8	18.7	52.9	1826	20.8
1980	5751.1	780	83.7	58.8	83.7	58.8	83.9	58.9	7450	84.8
1981	4763.2	780	69.6	60.5	69.6	60.5	69.7	60.7	6198	70.8
1982	4133.9	780	60.3	60.5	60.3	60.5	60.5	60.6	5407	61.7
1983	3549.4	780	51.7	59.4	51.7	59.4	51.9	59.6	4645	53.0
1984	4503.1	780	65.4	60.1	65.4	60.1	65.7	60.2	5746	65.4
1985	4967.4	780	72.4	61.3	72.4	61.3	72.7	61.5	6466	73.8
1986	3997.8	780	58.4	61.0	58.4	61.0	58.5	61.2	5183	59.2
1987	4621.8	780	70.3	61.8	67.3	61.5	67.6	61.7	6154	70.3
1988	3071.3	780	45.5	60.5	45.5	60.3	44.8	60.4	4001	45.5
1989	3991.5	780	59.5	60.5	59.5	60.3	58.4	60.3	5213	59.5
1990	1727.9	780	20.8	57.9	20.8	57.7	25.3	58.0	2218	25.3
1991	2265.8	780	32.2	56.3	32.2	56.1	33.2	56.5	3054	34.9
1992	4873.8	780	70.8	57.1	70.8	57.0	71.1	57.3	6226	70.9
1993	5757.0	780	84.0	58.6	84.0	58.4	84.3	58.8	7426	84.8
1994	3357.3	780	49.3	58.1	49.3	58.0	49.1	58.3	4299	49.1
1995	4458.7	780	65.1	58.5	65.1	58.3	65.3	58.6	5906	67.4
1996	6709.1	780	97.7	60.3	97.3	60.2	97.9	60.5	8629	98.2

1997	4981.2	780	72.5	60.9	72.5	60.7	72.9	61.1	6306	72.0
1998	5972.9	780	87.0	62.0	87.0	61.9	87.4	62.2	7657	87.4
1999	5989.8	780	87.2	63.0	87.2	62.9	87.7	63.2	7717	88.1
2000	6849.9	780	99.5	64.5	99.5	64.4	100.0	64.7	8784	100.0
2001	5901.0	780	86.0	65.3	86.0	65.2	86.4	65.5	7572	86.4
2002	6097.7	780	87.0	66.1	87.0	66.0	89.2	66.4	7626	87.1
2003	5470.8	780	76.4	66.5	76.4	66.4	80.1	66.9	6717	76.7
2004	6346.6	780	89.3	67.3	88.9	67.1	92.6	67.8	7839	89.2
2005	6249.5	780	86.7	67.9	86.7	67.8	91.5	68.6	7625	87.0
2006	5653.4	780	78.3	68.2	78.3	68.1	82.7	69.0	6890	78.7
2007	4521.8	780	62.5	68.1	62.5	67.9	66.2	68.9	5483	62.6
2008	4042.5	780	56.1	67.7	56.1	67.6	59.0	68.6	4949	56.3
2009	5720.1	780	79.3	68.0	79.3	67.9	83.7	69.1	6978	79.7
2010	4935.2	780	68.3	68.0	68.3	67.9	72.2	69.2	6017	68.7
2011	6502.5	780	90.1	68.7	90.1	68.5	95.2	69.9	7895	90.1
2012	0.0	780	0.0	66.8	0.0	66.7	0.0	68.0	0	0.0
2013	0.0	780	0.0	65.1	0.0	65.0	0.0	66.2	0	0.0
2014	0.0	780	0.0	63.4	0.0	63.3	0.0	64.5	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1976 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					261	
C. Inspection, maintenance or repair combined with refuelling				2117		
D. Inspection, maintenance or repair without refuelling				8		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				51		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			420		
L. Human factor related					5	
Z. Other					14	
Subtotal	8760	0	0	2596	280	0
Total	8760			2876		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1976 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		183
16. Steam generation systems		68
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		6
42. Electrical Power Supply Systems		1
Total	0	260

## JP-29 TAKAHAMA-3

Operator: KEPCO (Kansai Electric Power Co.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 830.0 MW(e)  
 Design Net Capacity: 830.0 MW(e)  
 Design Discharge Burnup: 40000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(12/2/20-) IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 12 Dec 1980      Lifetime Generation: 166718.0 GW(e)·h  
 Date of First Criticality: 17 Apr 1984      Cumulative Energy Availability Factor: 74.5%  
 Date of Grid Connection: 09 May 1984      Cumulative Load Factor: 76.5%  
 Date of Commercial Operation: 17 Jan 1985      Cumulative Unit Capability Factor: 74.5%  
    Cumulative Energy Unavailability Factor: 25.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	6199.5	830	84.7	84.7	84.7	84.7	85.3	85.3	7426	84.8
1986	6833.6	830	93.1	88.9	93.1	88.9	94.0	89.6	8215	93.8
1987	6030.4	830	82.9	86.9	82.9	86.9	82.9	87.4	7265	82.9
1988	5743.2	830	79.1	85.0	79.1	85.0	78.8	85.2	6948	79.1
1989	5987.2	830	81.5	84.3	81.5	84.3	82.3	84.7	7138	81.5
1990	6775.0	830	91.9	85.5	91.9	85.5	93.2	86.1	8143	93.0
1991	5513.6	830	73.9	83.9	73.9	83.9	75.8	84.6	6641	75.8
1992	6059.9	830	82.2	83.7	82.2	83.7	83.1	84.4	7292	83.0
1993	5804.8	830	77.6	83.0	77.6	83.0	79.8	83.9	6983	79.7
1994	7361.1	830	100.0	84.7	100.0	84.7	101.2	85.6	8760	100.0
1995	5662.9	830	77.0	84.0	77.0	84.0	77.9	84.9	6809	77.7
1996	5479.3	830	74.2	83.2	74.2	83.2	75.2	84.1	6576	74.9
1997	6028.9	830	81.9	83.1	81.9	83.1	82.9	84.0	7206	82.3
1998	6853.7	830	93.1	83.8	93.1	83.8	94.3	84.8	8161	93.2
1999	6833.4	830	93.9	84.5	92.8	84.4	94.0	85.4	8131	92.8
2000	5898.9	830	79.9	84.2	79.9	84.1	80.9	85.1	7023	80.0
2001	6167.2	830	83.8	84.2	83.8	84.1	84.8	85.1	7340	83.8
2002	6463.3	830	87.3	84.3	87.3	84.3	88.9	85.3	7654	87.4
2003	7355.7	830	96.1	84.9	96.1	84.9	101.2	86.1	8421	96.1
2004	5625.1	830	74.1	84.4	74.1	84.4	77.2	85.7	6512	74.1
2005	5738.4	830	75.6	84.0	75.6	83.9	78.9	85.4	6656	76.0
2006	5702.9	830	75.0	83.6	75.0	83.5	78.4	85.0	6604	75.4



2007	6847.4	830	89.4	83.8	89.4	83.8	94.2	85.4	7834	89.4
2008	3102.6	830	40.6	82.0	40.6	82.0	42.6	83.6	3608	41.1
2009	5738.9	830	74.2	81.7	74.2	81.7	78.9	83.5	6525	74.5
2010	6212.1	830	79.7	81.6	79.7	81.6	85.4	83.5	7006	80.0
2011	7828.8	830	100.0	82.3	100.0	82.3	107.7	84.4	8760	100.0
2012	1079.9	830	13.9	79.9	13.9	79.8	14.8	81.9	1223	13.9
2013	0.0	830	0.0	77.1	0.0	77.1	0.0	79.1	0	0.0
2014	0.0	830	0.0	74.5	0.0	74.5	0.0	76.5	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					3	
C. Inspection, maintenance or repair combined with refuelling				1329		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				21		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			521		
H. Nuclear regulatory requirements					13	
J. Grid limitation, failure or grid unavailability						3
Z. Other					34	
Subtotal	8760	0	0	1871	50	3
Total	8760			1924		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		0
13. Reactor Auxiliary Systems		2
32. Feedwater and Main Steam System		0
Total	0	2

# JP-30 TAKAHAMA-4

Operator: KEPCO (Kansai Electric Power Co.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 830.0 MW(e)  
 Design Net Capacity: 830.0 MW(e)  
 Design Discharge Burnup: 40000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(11/7/21-) IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

## 5. Historical Summary

Date of Construction Start: 19 Mar 1981      Lifetime Generation: 163436.0 GW(e)·h  
 Date of First Criticality: 11 Oct 1984      Cumulative Energy Availability Factor: 74.1%  
 Date of Grid Connection: 01 Nov 1984      Cumulative Load Factor: 75.9%  
 Date of Commercial Operation: 05 Jun 1985      Cumulative Unit Capability Factor: 74.1%  
    Cumulative Energy Unavailability Factor: 25.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	4314.3	830	100.0	100.0	100.0	100.0	101.2	101.2	5136	100.0
1986	5864.0	830	79.6	87.1	79.6	87.1	80.7	88.2	7073	80.7
1987	5588.5	830	77.0	83.2	77.0	83.2	76.9	83.8	6743	77.0
1988	6437.9	830	87.3	84.3	87.3	84.3	88.3	85.1	7666	87.3
1989	6802.7	830	93.2	86.3	93.2	86.3	93.6	86.9	8167	93.2
1990	5174.6	830	69.0	83.2	69.0	83.2	71.2	84.1	6233	71.2
1991	6170.1	830	83.1	83.2	83.1	83.2	84.9	84.2	7409	84.6
1992	6048.4	830	81.9	83.0	81.9	83.0	83.0	84.1	7265	82.7
1993	7210.9	830	97.9	84.7	97.9	84.7	99.2	85.8	8578	97.9
1994	5767.2	830	78.5	84.1	78.5	84.1	79.3	85.1	6861	78.3
1995	5651.8	830	76.7	83.4	76.7	83.4	77.7	84.4	6785	77.5
1996	5666.5	830	76.7	82.8	76.7	82.8	77.7	83.9	6785	77.2
1997	7367.3	830	100.0	84.2	100.0	84.2	101.3	85.2	8760	100.0
1998	6470.2	830	87.8	84.4	87.8	84.4	89.0	85.5	7727	88.2
1999	5500.3	830	75.8	83.8	74.6	83.8	75.6	84.8	6542	74.7
2000	6099.0	830	82.6	83.8	82.6	83.7	83.7	84.8	7254	82.6
2001	7364.6	830	100.0	84.7	100.0	84.7	101.3	85.8	8760	100.0
2002	6145.5	830	83.5	84.7	83.5	84.6	84.5	85.7	7316	83.5
2003	6490.2	830	86.0	84.7	86.0	84.7	89.3	85.9	7531	86.0
2004	5987.8	830	78.2	84.4	78.2	84.3	82.1	85.7	6868	78.2
2005	6633.2	830	87.4	84.5	87.4	84.5	91.2	86.0	7657	87.4
2006	6589.8	830	86.6	84.6	86.6	84.6	90.6	86.2	7612	86.9

2007	5787.6	830	76.0	84.3	76.0	84.2	79.6	85.9	6688	76.3
2008	5009.8	830	65.6	83.5	65.6	83.4	68.7	85.2	5825	66.3
2009	7585.0	830	99.7	84.1	99.7	84.1	104.3	85.9	8760	100.0
2010	5379.6	830	69.4	83.6	69.4	83.5	74.0	85.5	6130	70.0
2011	4320.2	830	55.3	82.5	55.3	82.4	59.4	84.5	4847	55.3
2012	0.0	830	0.0	79.5	0.0	79.4	0.0	81.4	0	0.0
2013	0.0	830	0.0	76.7	0.0	76.7	0.0	78.6	0	0.0
2014	0.0	830	0.0	74.1	0.0	74.1	0.0	75.9	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					20	
C. Inspection, maintenance or repair combined with refuelling				1312		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			657		
J. Grid limitation, failure or grid unavailability						3
Z. Other					11	
Subtotal	8760	0	0	1969	31	3
Total	8760			2003		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		9
41. Main Generator Systems		11
Total	0	20

**JP-21 TOKAI-2**

Operator: JAPCO (JAPAN ATOMIC POWER CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

**1. Station Details**

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1060.0 MW(e)

Design Net Capacity: 1056.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

IMPLEMENTATION OF AFETY MEASURES AFTER THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

**5. Historical Summary**

Date of Construction Start: 03 Oct 1973      Lifetime Generation: 221610.0 GW(e)·h

Date of First Criticality: 18 Jan 1978      Cumulative Energy Availability Factor: 65.0%

Date of Grid Connection: 13 Mar 1978      Cumulative Load Factor: 65.3%

Date of Commercial Operation: 28 Nov 1978      Cumulative Unit Capability Factor: 65.6%

Cumulative Energy Unavailability Factor: 35.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1978			Data not provided							
1979	5209.5	1056	56.3	56.3	56.3	56.3	56.3	56.3	5481	62.6
1980	6743.2	1056	72.6	64.5	72.6	64.5	72.7	64.5	6597	75.1
1981	6059.1	1056	65.3	64.7	65.3	64.7	65.5	64.8	6037	68.9
1982	5571.6	1056	59.6	63.5	59.6	63.5	60.2	63.7	5338	60.9
1983	6556.6	1056	70.5	64.9	70.5	64.9	70.9	65.1	6327	72.2
1984	8695.2	1056	93.5	69.6	93.5	69.6	93.7	69.9	8240	93.8
1985	6957.5	1056	75.0	70.4	75.0	70.4	75.2	70.7	6625	75.6
1986	5797.6	1056	62.5	69.4	62.5	69.4	62.7	69.7	5508	62.9
1987	7040.5	1056	76.5	70.2	76.5	70.2	76.1	70.4	6776	77.4
1988	6088.4	1056	66.0	69.8	66.0	69.8	65.6	69.9	5872	66.8
1989	8435.0	1056	91.2	71.7	91.2	71.7	91.2	71.8	8006	91.4
1990	7291.6	1056	78.9	72.3	78.9	72.3	78.8	72.4	6948	79.3
1991	7025.3	1056	76.1	72.6	76.1	72.6	75.9	72.7	6716	76.7
1992	6307.7	1080	68.6	72.3	68.5	72.3	66.5	72.2	5990	68.2
1993	8707.2	1080	93.8	73.8	93.8	73.8	92.0	73.6	8252	94.2
1994	7325.8	1056	78.9	74.1	78.9	74.1	79.2	73.9	6938	79.2
1995	6845.0	1056	73.7	74.1	73.7	74.1	74.0	73.9	6488	74.1
1996	7562.1	1056	80.8	74.4	80.7	74.4	81.5	74.4	7169	81.6
1997	8884.5	1056	95.7	75.6	95.6	75.5	96.0	75.5	8404	95.9
1998	6999.4	1056	75.1	75.5	75.0	75.5	75.7	75.5	6642	75.8
1999	2316.1	1056	25.4	73.2	24.9	73.1	25.0	73.1	2228	25.4
2000	7031.6	1056	76.3	73.3	75.4	73.2	75.8	73.2	6626	75.4

2001	5833.2	1056	62.7	72.8	62.7	72.8	63.1	72.8	5641	64.4
2002	6420.1	1056	70.0	72.7	68.9	72.6	69.4	72.6	6061	69.2
2003	9176.5	1056	98.6	73.7	98.5	73.6	99.2	73.7	8635	98.6
2004	7195.4	1060	76.5	73.9	76.3	73.7	77.3	73.8	6723	76.5
2005	5259.5	1060	55.8	73.2	55.8	73.1	56.6	73.2	4914	56.1
2006	8186.9	1060	87.9	73.7	87.3	73.6	88.2	73.7	7704	87.9
2007	7518.8	1060	80.0	73.9	80.0	73.8	81.0	74.0	7048	80.5
2008	6545.9	1060	68.8	73.8	68.8	73.6	70.3	73.9	6132	69.8
2009	5587.4	1060	58.7	73.3	58.7	73.2	60.2	73.4	5169	59.0
2010	5137.0	1060	53.9	72.7	53.9	72.6	55.3	72.9	4763	54.4
2011	1819.1	1060	38.4	71.6	19.1	70.9	19.6	71.2	1670	19.1
2012	0.0	1060	0.0	69.5	0.0	68.8	0.0	69.1	0	0.0
2013	0.0	1060	0.0	67.5	0.0	66.9	0.0	67.2	0	0.0
2014	0.0	1060	0.0	65.6	0.0	65.0	0.0	65.3	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1979 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					361	
C. Inspection, maintenance or repair combined with refuelling				1739		
D. Inspection, maintenance or repair without refuelling				26	8	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			518		
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						48
Z. Other					9	
Subtotal	8760	0	0	2283	378	50
Total	8760			2711		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1979 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		165
13. Reactor Auxiliary Systems		56
14. Safety Systems		25
15. Reactor Cooling Systems		33
31. Turbine and auxiliaries		33
32. Feedwater and Main Steam System		36
42. Electrical Power Supply Systems		9
Total	0	357

**JP-43 TOMARI-1****Operator:** HEPCO (HOKKAIDO ELECTRIC POWER CO.,INC.)**Contractor:** MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 550.0 MW(e)

**Design Net Capacity:** 550.0 MW(e)

**Design Discharge Burnup:** 41000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 0.0 GW(e)·h

**Energy Availability Factor:** 0.0%

**Load Factor:** 0.0%

**Operating Factor:** 0.0%

**Energy Unavailability Factor:** 100.0%

**Total Off-line Time:** 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>PUf (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSIMA DAI-ICH AND DAI-NI NUCLEAR POWER STATIONS ENFORCEMENT OF COMPREHENSIVE ASSESSMENT FOR THE SAFETY OF NUCLEAR POWER REACTOR FACILITY(SO-CALLED STRESS TEST)

**5. Historical Summary**

**Date of Construction Start:** 18 Apr 1985 **Lifetime Generation:** 90971.0 GW(e)·h

**Date of First Criticality:** 16 Nov 1988 **Cumulative Energy Availability Factor:** 72.7%

**Date of Grid Connection:** 06 Dec 1988 **Cumulative Load Factor:** 73.5%

**Date of Commercial Operation:** 22 Jun 1989 **Cumulative Unit Capability Factor:** 72.7%

**Cumulative Energy Unavailability Factor:** 27.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	2802.8	550	99.6	99.6	99.6	99.6	99.2	99.2	5136	100.0
1990	3830.7	550	79.5	86.9	79.5	86.9	79.5	86.8	7092	81.0
1991	3540.4	550	73.5	81.7	73.5	81.7	73.5	81.6	6588	75.2
1992	3646.4	550	75.9	80.1	75.9	80.1	75.5	79.9	6780	77.2
1993	4795.2	550	100.0	84.4	100.0	84.4	99.5	84.2	8760	100.0
1994	3903.9	550	81.4	83.9	81.4	83.9	81.0	83.6	7208	82.3
1995	3946.3	550	81.9	83.6	81.9	83.6	81.9	83.4	7175	81.9
1996	3750.4	550	78.1	82.8	78.1	82.8	77.6	82.6	6920	78.8
1997	4795.6	550	100.0	84.8	100.0	84.8	99.5	84.6	8760	100.0
1998	4239.1	550	83.1	84.7	83.1	84.7	88.0	84.9	7373	84.2
1999	4074.6	550	79.7	84.2	79.7	84.2	84.6	84.9	6986	79.7
2000	4168.5	550	86.5	84.4	86.5	84.4	86.3	85.0	7598	86.5
2001	4804.0	550	100.0	85.6	100.0	85.6	99.7	86.2	8760	100.0
2002	4177.3	550	86.9	85.7	86.9	85.7	86.7	86.2	7614	86.9
2003	3821.7	550	78.7	85.2	78.7	85.2	79.3	85.8	6893	78.7
2004	3788.8	550	77.0	84.7	77.0	84.7	78.4	85.3	6762	77.0
2005	4818.8	550	98.3	85.5	98.3	85.5	100.0	86.2	8616	98.4
2006	4236.7	550	86.9	85.6	86.9	85.6	87.9	86.3	7643	87.2
2007	3952.5	550	80.6	85.3	80.6	85.3	82.0	86.0	7121	81.3
2008	3111.1	550	63.1	84.2	63.1	84.2	64.4	84.9	5578	63.5
2009	4928.2	550	100.0	85.0	100.0	85.0	102.3	85.8	8760	100.0

2010	3994.6	550	81.3	84.8	81.3	84.8	82.9	85.6	7156	81.7
2011	1496.7	550	30.4	82.4	30.4	82.4	31.1	83.2	2664	30.4
2012	0.0	550	0.0	78.9	0.0	78.9	0.0	79.7	0	0.0
2013	0.0	550	0.0	75.7	0.0	75.7	0.0	76.5	0	0.0
2014	0.0	550	0.0	72.7	0.0	72.7	0.0	73.5	0	0.0

#### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					30	
C. Inspection, maintenance or repair combined with refuelling				1147		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			864		
Z. Other					21	
Subtotal	8760	0	0	2011	51	0
Total	8760			2062		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
32. Feedwater and Main Steam System		19
42. Electrical Power Supply Systems		10
Total	0	29

**JP-44 TOMARI-2****Operator:** HEPCO (HOKKAIDO ELECTRIC POWER CO.,INC.)**Contractor:** MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP at the beginning of 2014:** 550.0 MW(e)

**Design Net Capacity:** 550.0 MW(e)

**Design Discharge Burnup:** 41000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 0.0 GW(e)·h

**Energy Availability Factor:** 0.0%

**Load Factor:** 0.0%

**Operating Factor:** 0.0%

**Energy Unavailability Factor:** 100.0%

**Total Off-line Time:** 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EUUF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>PUF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSIMA DAI-ICH AND DAI-NI NUCLEAR POWER STATIONS ENFORCEMENT OF COMPREHENSIVE ASSESSMENT FOR THE SAFETY OF NUCLEAR POWER REACTOR FACILITY(SO-CALLED STRESS TEST)

**5. Historical Summary**

**Date of Construction Start:** 13 Jun 1985 **Lifetime Generation:** 83574.0 GW(e)·h

**Date of First Criticality:** 25 Jul 1990 **Cumulative Energy Availability Factor:** 71.3%

**Date of Grid Connection:** 27 Aug 1990 **Cumulative Load Factor:** 72.4%

**Date of Commercial Operation:** 12 Apr 1991 **Cumulative Unit Capability Factor:** 71.3%

**Cumulative Energy Unavailability Factor:** 28.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1991	2759.6	550	76.0	76.0	76.0	76.0	76.0	76.0	5076	76.9
1992	3639.6	550	75.5	75.7	75.5	75.7	75.3	75.6	6756	76.9
1993	3847.5	550	80.0	77.3	80.0	77.3	79.9	77.2	7092	81.0
1994	4511.6	550	93.9	81.7	93.9	81.7	93.6	81.6	8232	94.0
1995	4161.9	550	85.5	82.5	85.5	82.5	86.4	82.6	7567	86.4
1996	3933.6	550	81.5	82.3	81.5	82.3	81.4	82.4	7232	82.3
1997	3775.2	550	78.5	81.8	78.5	81.8	78.4	81.8	6943	79.3
1998	5071.6	550	100.0	84.1	100.0	84.1	105.3	84.8	8760	100.0
1999	4273.2	550	83.8	84.1	83.8	84.1	88.7	85.2	7344	83.8
2000	4107.5	550	85.1	84.2	85.1	84.2	85.0	85.2	7477	85.1
2001	3971.3	550	82.6	84.0	82.6	84.0	82.4	85.0	7235	82.6
2002	4516.1	550	93.9	84.9	93.9	84.9	93.7	85.7	8228	93.9
2003	3542.0	550	71.9	83.9	71.9	83.9	73.5	84.8	6300	71.9
2004	3864.7	550	78.1	83.4	78.1	83.4	80.0	84.4	6862	78.1
2005	4252.6	550	86.0	83.6	86.0	83.6	88.3	84.7	7571	86.4
2006	4316.9	550	87.9	83.9	87.9	83.9	89.6	85.0	7704	87.9
2007	4663.2	550	94.8	84.5	94.8	84.5	96.8	85.7	8339	95.2
2008	3018.3	550	61.4	83.2	61.4	83.2	62.5	84.4	5411	61.6
2009	3436.4	550	69.6	82.5	69.6	82.5	71.3	83.7	6131	70.0
2010	4043.3	550	82.1	82.5	82.1	82.5	83.9	83.7	7232	82.6
2011	3194.7	550	64.9	81.6	64.9	81.6	66.3	82.9	5688	64.9



2012	0.0	550	0.0	77.9	0.0	77.9	0.0	79.0	0	0.0
2013	0.0	550	0.0	74.5	0.0	74.5	0.0	75.6	0	0.0
2014	0.0	550	0.0	71.3	0.0	71.3	0.0	72.4	0	0.0

#### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1991 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					71	
C. Inspection, maintenance or repair combined with refuelling				1189		
D. Inspection, maintenance or repair without refuelling				63		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			774		
Subtotal	8760	0	0	2026	71	0
Total	8760			2097		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1991 to 2014 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		71
Total	0	71

**JP-64 TOMARI-3**

Operator: HEPKO (HOKKAIDO ELECTRIC POWER CO.,INC.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

**1. Station Details**

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 866.0 MW(e)

Design Net Capacity: 866.0 MW(e)

Design Discharge Burnup: 49000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

IMPLEMENTATION OF EMERGENCY SAFETY MEASURES FOR CONSIDERING THE ACCIDENT OF FUKUSIMA DAI-ICH AND DAI-NI NUCLEAR POWER STATIONS ENFORCEMENT OF COMPREHENSIVE ASSESSMENT FOR THE SAFETY OF NUCLEAR POWER REACTOR FACILITY(SO-CALLED STRESS TEST)

**5. Historical Summary**

Date of Construction Start: 18 Nov 2004      Lifetime Generation: 19620.0 GW(e)·h

Date of First Criticality: 03 Mar 2009      Cumulative Energy Availability Factor: 44.4%

Date of Grid Connection: 20 Mar 2009      Cumulative Load Factor: 46.3%

Date of Commercial Operation: 22 Dec 2009      Cumulative Unit Capability Factor: 44.4%

   Cumulative Energy Unavailability Factor: 55.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2009	670.0	866	100.0	100.0	100.0	100.0	104.0	104.0	744	100.0
2010	7904.9	866	100.0	100.0	100.0	100.0	104.2	104.2	8760	100.0
2011	6556.8	866	82.9	91.8	82.9	91.8	86.4	95.7	7283	83.1
2012	2731.8	866	34.4	73.1	34.4	73.1	35.9	76.3	3023	34.4
2013	0.0	866	0.0	55.2	0.0	55.2	0.0	57.6	0	0.0
2014	0.0	866	0.0	44.4	0.0	44.4	0.0	46.3	0	0.0

**6. Full Outages, Analysis by Cause**

Outage Cause	2014 Hours Lost			2011 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling				789		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			3210		
Subtotal	8760	0	0	3999	0	0
Total	8760			3999		

**7. Equipment Related Full Outages, Analysis by System**

System	2014	2011 to 2014
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System	Hours Lost	Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

# JP-3 TSURUGA-1

Operator: JAPCO (JAPAN ATOMIC POWER CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 340.0 MW(e)  
 Design Net Capacity: 341.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

IMPLEMENTATION OF AFETY MEASURES AFTER THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

## 5. Historical Summary

Date of Construction Start: 24 Nov 1966      Lifetime Generation: 80050.0 GW(e)·h  
 Date of First Criticality: 03 Oct 1969      Cumulative Energy Availability Factor: 61.3%  
 Date of Grid Connection: 16 Nov 1969      Cumulative Load Factor: 60.8%  
 Date of Commercial Operation: 14 Mar 1970      Cumulative Unit Capability Factor: 61.4%  
    Cumulative Energy Unavailability Factor: 38.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1970	1797.0	357	68.5	68.5	68.5	68.5	68.5	68.5	5680	77.3
1971	2122.2	357	72.1	70.5	72.1	70.5	67.9	68.2	6312	72.1
1972	2272.2	357	76.0	72.4	76.0	72.4	72.5	69.7	7031	80.0
1973	2396.8	342	80.0	74.3	80.0	74.3	80.0	72.3	7485	85.4
1974	1819.1	320	64.9	72.5	64.9	72.5	64.9	70.9	6009	68.6
1975	1004.4	321	35.6	66.6	35.6	66.6	35.7	65.2	3301	37.7
1976	2036.3	340	68.4	66.9	68.4	66.9	68.2	65.7	6676	76.0
1977	1084.0	340	36.4	63.0	36.4	63.0	36.4	61.9	3548	40.5
1978	2039.8	340	68.5	63.6	68.5	63.6	68.5	62.7	6565	74.9
1979	1818.9	321	64.7	63.7	64.7	63.7	64.7	62.9	5873	67.0
1980	2063.1	321	73.1	64.5	73.1	64.5	73.2	63.8	6669	75.9
1981	663.4	340	27.1	61.4	27.1	61.4	22.3	60.2	2139	24.4
1982	1614.0	340	59.5	61.2	59.5	61.2	54.2	59.8	5245	59.9
1983	1972.1	340	69.8	61.8	69.8	61.8	66.2	60.2	6464	73.8
1984	2643.1	325	92.1	63.8	92.1	63.8	92.4	62.3	8129	92.5
1985	1703.6	340	57.3	63.4	57.3	63.4	57.2	62.0	5088	58.1
1986	2286.3	340	77.5	64.2	77.1	64.2	76.8	62.9	6863	78.3
1987	2349.2	340	80.2	65.1	80.2	65.1	78.9	63.8	7052	80.5
1988	2222.9	341	74.8	65.7	74.8	65.6	74.2	64.4	6611	75.3
1989	2457.7	341	82.8	66.5	82.8	66.5	82.3	65.3	7298	83.3
1990	1959.8	341	65.6	66.5	65.6	66.5	65.6	65.3	5822	66.5
1991	2255.9	341	76.6	67.0	76.1	66.9	75.5	65.8	6742	77.0
1992	1994.1	341	66.9	67.0	66.7	66.9	66.6	65.8	5914	67.3

1993	2623.7	341	87.5	67.8	87.5	67.8	87.8	66.7	7745	88.4
1994	1507.5	341	50.5	67.1	50.5	67.1	50.5	66.1	4477	51.1
1995	2328.7	341	79.7	67.6	77.3	67.5	78.0	66.5	7027	80.2
1996	2514.2	341	84.0	68.2	84.0	68.1	83.9	67.2	7411	84.4
1997	1936.1	341	64.8	68.1	64.8	68.0	64.8	67.1	5728	65.4
1998	1870.5	341	62.7	67.9	62.7	67.8	62.6	66.9	5528	63.1
1999	1845.0	341	63.2	67.8	62.5	67.6	61.8	66.8	5542	63.3
2000	0.0	341	0.0	65.5	0.0	65.4	0.0	64.6	0	0.0
2001	2584.5	341	86.6	66.2	86.6	66.1	86.5	65.3	7594	86.7
2002	2546.6	341	85.5	66.8	85.3	66.7	85.3	65.9	7495	85.6
2003	2426.3	341	81.0	67.2	80.7	67.1	81.2	66.3	7135	81.4
2004	2535.9	341	84.2	67.7	84.1	67.6	84.7	66.9	7395	84.2
2005	2547.6	341	85.0	68.2	85.0	68.1	85.3	67.4	7568	86.4
2006	2845.0	340	95.1	68.9	95.0	68.8	95.5	68.2	8558	97.7
2007	1267.1	340	42.6	68.2	42.5	68.1	42.5	67.5	3757	42.9
2008	2276.6	340	73.3	68.4	72.7	68.2	76.2	67.7	6696	76.2
2009	171.4	340	5.8	66.8	5.8	66.6	5.8	66.1	521	5.9
2010	2565.1	340	86.3	67.3	86.1	67.1	86.1	66.6	7568	86.4
2011	203.5	340	6.8	65.8	6.8	65.7	6.8	65.2	600	6.8
2012	0.0	340	0.0	64.3	0.0	64.1	0.0	63.7	0	0.0
2013	0.0	340	0.0	62.8	0.0	62.7	0.0	62.2	0	0.0
2014	0.0	340	0.0	61.4	0.0	61.3	0.0	60.8	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					343	
C. Inspection, maintenance or repair combined with refuelling				1846	17	
D. Inspection, maintenance or repair without refuelling				81		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				429		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			367		
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Z. Other					8	
Subtotal	8760	0	0	2723	368	1
Total	8760			3092		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		59
12. Reactor I&C Systems		86
14. Safety Systems		23
15. Reactor Cooling Systems		107
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		47
32. Feedwater and Main Steam System		5
42. Electrical Power Supply Systems		8
Total	0	339

## JP-34 TSURUGA-2

Operator: JAPCO (JAPAN ATOMIC POWER CO.)

Contractor: MHI (MITSUBISHI HEAVY INDUSTRIES LTD.)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1108.0 MW(e)

Design Net Capacity: 1115.0 MW(e)

Design Discharge Burnup: 43000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h

Energy Availability Factor: 0.0%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.0%

Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

IMPLEMENTATION OF AFETY MEASURES AFTER THE ACCIDENT OF FUKUSHIMA NUCLEAR POWER STATIONS.

### 5. Historical Summary

Date of Construction Start: 06 Nov 1982      Lifetime Generation: 185893.0 GW(e)·h

Date of First Criticality: 28 May 1986      Cumulative Energy Availability Factor: 67.6%

Date of Grid Connection: 19 Jun 1986      Cumulative Load Factor: 67.8%

Date of Commercial Operation: 17 Feb 1987      Cumulative Unit Capability Factor: 67.7%

Cumulative Energy Unavailability Factor: 32.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	8498.3	1115	95.4	95.4	95.4	95.4	95.1	95.1	7656	95.5
1988	7939.7	1115	81.3	88.0	81.3	88.0	81.1	87.8	7243	82.5
1989	7507.7	1115	77.0	84.2	77.0	84.2	76.9	84.0	6814	77.8
1990	7201.0	1115	72.9	81.3	72.9	81.3	73.7	81.4	6462	73.8
1991	9259.2	1115	95.1	84.1	95.1	84.1	94.8	84.1	8338	95.2
1992	8118.7	1115	82.5	83.9	82.5	83.9	82.9	83.9	7310	83.2
1993	7844.1	1115	80.2	83.3	80.2	83.3	80.3	83.4	7086	80.9
1994	7814.6	1115	80.2	82.9	80.2	82.9	80.0	83.0	7080	80.8
1995	9220.5	1115	94.5	84.2	94.5	84.2	94.4	84.2	8290	94.6
1996	8092.3	1115	83.0	84.1	83.0	84.1	82.6	84.1	7325	83.4
1997	6522.2	1115	67.0	82.5	67.0	82.5	66.8	82.5	5946	67.9
1998	8534.6	1115	92.0	83.3	92.0	83.3	87.4	82.9	7724	88.2
1999	5131.7	1115	52.7	81.0	52.7	81.0	52.5	80.6	4615	52.7
2000	8993.8	1115	92.1	81.8	92.1	81.8	91.8	81.4	8087	92.1
2001	8072.7	1115	82.9	81.8	82.9	81.8	82.6	81.5	7267	83.0
2002	8695.5	1115	88.4	82.2	88.4	82.2	89.0	81.9	7742	88.4
2003	8460.9	1115	84.7	82.4	84.7	82.4	86.6	82.2	7418	84.7
2004	9447.0	1115	95.2	83.1	95.2	83.1	96.5	83.0	8367	95.3
2005	7693.6	1115	77.6	82.8	77.6	82.8	78.8	82.8	6854	78.2
2006	6250.8	1110	63.3	81.8	63.3	81.8	64.3	81.9	5634	64.3
2007	6065.3	1110	64.9	81.0	61.2	80.9	62.4	80.9	5688	64.9
2008	992.7	1110	10.0	77.8	10.0	77.6	10.2	77.7	957	10.9
2009	8701.1	1108	87.3	78.2	87.3	78.1	89.6	78.2	7680	87.7

2010	6178.2	1108	61.7	77.5	61.7	77.4	63.7	77.6	5446	62.2
2011	3526.9	1108	34.7	75.8	34.7	75.7	36.3	76.0	3041	34.7
2012	0.0	1108	0.0	72.9	0.0	72.8	0.0	73.0	0	0.0
2013	0.0	1108	0.0	70.2	0.0	70.1	0.0	70.3	0	0.0
2014	0.0	1108	0.0	67.7	0.0	67.6	0.0	67.8	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					489	
C. Inspection, maintenance or repair combined with refuelling				1361		
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8760			636		
L. Human factor related					4	
P. Fire					10	
Subtotal	8760	0	0	1997	503	0
Total	8760			2500		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		97
13. Reactor Auxiliary Systems		191
14. Safety Systems		21
15. Reactor Cooling Systems		15
31. Turbine and auxiliaries		130
32. Feedwater and Main Steam System		33
Total	0	487

## KR-7 HANBIT-1

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 961.0 MW(e)  
**Design Net Capacity:** 903.0 MW(e)  
**Design Discharge Burnup:** 18190 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 8729.4 GW(e)·h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 103.7%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	749.3	677.0	748.8	723.5	743.3	712.5	732.3	729.4	708.2	738.2	719.4	747.5	8729.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>LF (%)</b>	104.8	104.8	104.7	104.6	104.0	103.0	102.4	102.0	102.3	103.2	104.0	104.6	103.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

OPERATION ON UPDATED POWER BUT MORE TIME NEEDED TO DEMONSTRATE THE NEW RUP.

### 5. Historical Summary

**Date of Construction Start:** 04 Jun 1981      **Lifetime Generation:** 206680.5 GW(e)·h  
**Date of First Criticality:** 31 Jan 1986      **Cumulative Energy Availability Factor:** 88.5%  
**Date of Grid Connection:** 05 Mar 1986      **Cumulative Load Factor:** 90.5%  
**Date of Commercial Operation:** 25 Aug 1986      **Cumulative Unit Capability Factor:** 88.6%  
**Cumulative Energy Unavailability Factor:** 11.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	2467.9	900	95.8	95.8	95.6	95.6	74.7	74.7	2928	79.7
1987	5973.9	900	78.8	83.8	78.8	83.7	75.8	75.4	6870	78.4
1988	6199.6	900	77.9	81.4	77.9	81.3	78.4	76.7	6844	77.9
1989	6451.8	900	81.5	81.4	81.5	81.4	81.8	78.2	7136	81.5
1990	6897.5	900	85.7	82.4	85.7	82.3	87.5	80.3	7507	85.7
1991	6695.6	900	84.3	82.7	84.3	82.7	84.9	81.1	7383	84.3
1992	6947.3	900	86.5	83.3	86.5	83.3	87.9	82.2	7600	86.5
1993	6724.0	900	86.8	83.8	86.8	83.8	85.3	82.6	7603	86.8
1994	8230.1	890	99.4	85.6	99.4	85.6	105.6	85.3	8751	99.9
1995	6094.6	900	74.9	84.5	74.9	84.5	77.3	84.5	6781	77.4
1996	6755.5	900	81.4	84.2	81.3	84.2	85.5	84.6	7255	82.6
1997	8236.1	900	99.4	85.5	99.4	85.5	104.5	86.3	8741	99.8
1998	7104.5	900	85.5	85.5	85.5	85.5	90.1	86.6	7599	86.7
1999	6730.0	900	81.1	85.2	81.1	85.2	85.4	86.5	7242	82.7
2000	7215.1	900	87.5	85.3	87.5	85.3	91.3	86.8	7696	87.6
2001	8346.4	900	99.9	86.3	99.9	86.3	105.9	88.1	8760	100.0
2002	7419.0	900	88.8	86.4	88.8	86.4	94.1	88.4	7867	89.8
2003	7074.4	900	86.3	86.4	86.3	86.4	89.7	88.5	7593	86.7
2004	7207.2	900	86.7	86.5	86.7	86.4	91.2	88.7	7688	87.5
2005	8302.9	900	100.0	87.1	100.0	87.1	105.3	89.5	8760	100.0
2006	7545.1	945	91.1	87.3	91.1	87.3	91.1	89.6	8030	91.7
2007	6466.5	942	77.6	86.9	77.3	86.9	78.4	89.1	6855	78.3
2008	8434.7	953	100.0	87.5	99.9	87.5	100.8	89.6	8784	100.0



2009	7414.0	953	89.0	87.6	88.4	87.5	88.8	89.6	7785	88.9
2010	7791.1	953	92.7	87.8	92.4	87.7	93.3	89.7	8158	93.1
2011	8417.7	953	100.0	88.3	99.8	88.2	100.8	90.2	8760	100.0
2012	7733.5	959	91.8	88.4	91.3	88.3	91.8	90.3	8103	92.2
2013	6911.4	960	81.8	88.2	81.1	88.1	82.2	89.9	7204	82.2
2014	8729.4	961	100.0	88.6	100.0	88.5	103.7	90.5	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					56	
C. Inspection, maintenance or repair combined with refuelling				880		
D. Inspection, maintenance or repair without refuelling				5		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					0	
Z. Other						1
Subtotal	0	0	0	885	56	1
Total	0			942		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		6
15. Reactor Cooling Systems		1
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		2
41. Main Generator Systems		37
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		0
Total	0	52

## KR-8 HANBIT-2

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 977.0 MW(e)  
 Design Net Capacity: 903.0 MW(e)  
 Design Discharge Burnup: 17960 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6661.5 GW(e)·h  
 Energy Availability Factor: 76.8%  
 Load Factor: 77.8%  
 Operating Factor: 77.5%  
 Energy Unavailability Factor: 23.2%  
 Total Off-line Time: 1971 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	742.3	657.3	553.3	716.2	735.8	704.8	724.3	723.4	109.1	0.0	251.3	743.6	6661.5
EAF (%)	100.0	98.0	74.6	100.0	100.0	99.9	99.6	99.5	15.5	0.0	35.0	100.0	76.8
UCF (%)	100.0	98.1	74.7	100.0	100.0	100.0	100.0	100.0	15.5	0.0	35.0	100.0	76.9
LF (%)	102.1	100.1	76.1	101.8	101.2	100.2	99.6	99.5	15.5	0.0	35.7	102.3	77.8
OF (%)	100.0	98.1	76.5	100.0	100.0	100.0	100.0	100.0	18.1	0.0	37.6	100.0	77.5
EUUF (%)	0.0	2.0	25.4	0.0	0.0	0.1	0.4	0.5	84.5	100.0	65.0	0.0	23.2
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84.5	100.0	65.0	0.0	20.8
UCLF (%)	0.0	2.0	25.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.5	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1. AUTOMATIC REACTOR SCRAM[CAUSE : SG PRESSURE LO('14.2.28~3.8)]2. REFUELING AND MAINTENANCE('14.9.6~11.19)

### 5. Historical Summary

Date of Construction Start: 10 Dec 1981      Lifetime Generation: 196117.1 GW(e)·h  
 Date of First Criticality: 15 Oct 1986      Cumulative Energy Availability Factor: 86.0%  
 Date of Grid Connection: 11 Nov 1986      Cumulative Load Factor: 87.9%  
 Date of Commercial Operation: 10 Jun 1987      Cumulative Unit Capability Factor: 86.1%  
    Cumulative Energy Unavailability Factor: 14.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	4297.0	900	98.1	98.1	98.1	98.1	97.0	97.0	4826	98.1
1988	6280.9	900	80.6	86.9	80.6	86.9	79.4	85.8	7085	80.7
1989	5703.2	900	73.6	81.7	73.6	81.7	72.3	80.5	6446	73.6
1990	5964.5	900	77.1	80.4	77.1	80.4	75.7	79.2	6757	77.1
1991	6715.0	900	84.9	81.4	84.9	81.4	85.2	80.5	7433	84.9
1992	6434.6	900	82.6	81.6	82.6	81.6	81.4	80.6	7259	82.6
1993	6930.5	900	85.8	82.3	85.7	82.2	87.9	81.7	7506	85.7
1994	7132.9	890	85.5	82.7	85.5	82.7	91.5	83.0	7687	87.8
1995	6036.5	900	74.2	81.7	74.2	81.7	76.6	82.3	6696	76.4
1996	7656.1	900	91.6	82.7	91.6	82.7	96.8	83.8	8189	93.2
1997	6657.3	900	81.2	82.6	81.2	82.6	84.4	83.9	7453	85.1
1998	6010.4	900	74.5	81.9	74.4	81.9	76.2	83.2	6583	75.1
1999	6718.9	900	82.1	81.9	82.1	81.9	85.2	83.4	7301	83.3
2000	7144.1	900	87.1	82.3	87.1	82.3	90.4	83.9	7753	88.3
2001	7169.7	900	87.1	82.6	87.1	82.6	90.9	84.4	7726	88.2
2002	8194.2	900	99.9	83.7	99.6	83.7	103.9	85.6	8744	99.8
2003	7413.3	900	89.7	84.1	89.6	84.1	94.0	86.1	7931	90.5
2004	7242.9	900	87.5	84.3	87.5	84.3	91.6	86.4	7764	88.4
2005	7302.4	900	88.6	84.5	88.6	84.5	92.6	86.8	7881	90.0
2006	8195.7	939	100.0	85.3	99.9	85.3	99.6	87.5	8719	99.5
2007	7030.1	936	85.1	85.3	84.4	85.3	85.7	87.4	7523	85.9
2008	7472.9	947	89.0	85.5	88.9	85.4	89.8	87.5	7850	89.4

2009	8376.9	947	100.0	86.2	99.9	86.1	101.0	88.1	8760	100.0
2010	7461.5	947	88.9	86.3	88.9	86.2	89.9	88.2	7830	89.4
2011	7600.6	947	90.7	86.5	90.4	86.4	91.6	88.3	7988	91.2
2012	8383.4	958	100.0	87.0	99.5	86.9	99.6	88.8	8784	100.0
2013	6277.1	958	73.2	86.5	73.2	86.4	74.8	88.3	6509	74.3
2014	6661.5	977	76.9	86.1	76.8	86.0	77.8	87.9	6789	77.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		188			36	
C. Inspection, maintenance or repair combined with refuelling	1786			934		
D. Inspection, maintenance or repair without refuelling				90		
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					3	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Subtotal	1786	188	0	1024	39	1
Total	1974			1064		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		1
15. Reactor Cooling Systems		1
16. Steam generation systems	188	6
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		3
35. All other I&C Systems		0
41. Main Generator Systems		14
42. Electrical Power Supply Systems		6
Total	188	33

## KR-11 HANBIT-3

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKAEC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA ATOMICENERGY RESEARCH IN

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1000.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 42700 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6882.5 GW(e)·h  
**Energy Availability Factor:** 78.5%  
**Load Factor:** 78.6%  
**Operating Factor:** 79.2%  
**Energy Unavailability Factor:** 21.5%  
**Total Off-line Time:** 1822 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	744.4	671.5	743.9	719.8	741.5	711.9	732.6	730.4	707.2	379.5	0.0	0.0	6882.5
<b>EAF (%)</b>	100.0	99.9	99.9	99.9	99.7	98.9	98.5	98.2	98.2	51.0	0.0	0.0	78.5
<b>UCF (%)</b>	100.0	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0	51.7	0.0	0.0	79.2
<b>LF (%)</b>	100.0	99.9	100.0	100.0	99.7	98.9	98.5	98.2	98.2	51.0	0.0	0.0	78.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	51.9	0.0	0.0	79.2
<b>EUf (%)</b>	0.0	0.1	0.1	0.1	0.3	1.1	1.5	1.8	1.8	49.0	100.0	100.0	21.5
<b>PUf (%)</b>	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	48.3	100.0	100.0	20.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.1	0.3	1.1	1.5	1.8	1.7	0.6	0.0	0.0	0.6

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

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### 5. Historical Summary

**Date of Construction Start:** 23 Dec 1989 **Lifetime Generation:** 150664.4 GW(e)·h  
**Date of First Criticality:** 13 Oct 1994 **Cumulative Energy Availability Factor:** 87.1%  
**Date of Grid Connection:** 30 Oct 1994 **Cumulative Load Factor:** 88.2%  
**Date of Commercial Operation:** 31 Mar 1995 **Cumulative Unit Capability Factor:** 87.2%  
**Cumulative Energy Unavailability Factor:** 12.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1995	6430.3	950	99.3	99.3	99.3	99.3	92.2	92.2	6573	89.5
1996	6366.2	950	74.0	85.5	74.0	85.5	76.3	83.5	6589	75.0
1997	7229.6	950	84.0	85.0	84.0	85.0	86.9	84.7	7443	85.0
1998	7400.8	950	85.5	85.1	85.5	85.1	88.9	85.8	7566	86.4
1999	7395.3	950	86.7	85.4	86.7	85.4	88.9	86.4	7678	87.6
2000	7262.0	950	85.6	85.5	85.6	85.5	87.0	86.5	7568	86.2
2001	8629.1	950	100.0	87.6	100.0	87.6	103.7	89.0	8760	100.0
2002	7658.2	950	89.1	87.8	89.1	87.8	92.0	89.4	7831	89.4
2003	7818.1	950	90.1	88.0	90.1	88.0	93.9	89.9	7971	91.0
2004	7654.7	950	90.4	88.3	90.3	88.3	91.7	90.1	7801	88.8
2005	8675.6	950	100.0	89.4	100.0	89.4	104.2	91.4	8760	100.0
2006	7556.8	985	87.4	89.2	87.3	89.2	87.6	91.1	7800	89.0
2007	7778.3	987	90.8	89.3	90.2	89.3	90.0	91.0	7916	90.4
2008	7861.9	997	90.2	89.4	90.1	89.3	89.8	90.9	7967	90.7
2009	8737.2	997	100.0	90.1	100.0	90.1	100.0	91.5	8760	100.0
2010	7953.9	997	91.1	90.2	90.7	90.1	91.1	91.5	8014	91.5
2011	7944.1	997	90.5	90.2	90.4	90.1	91.0	91.5	7973	91.0
2012	6961.9	1000	79.5	89.6	79.0	89.5	79.3	90.8	6994	79.6
2013	4719.1	997	54.3	87.7	54.0	87.5	54.0	88.8	4809	54.9
2014	6882.5	1000	79.2	87.2	78.5	87.1	78.6	88.2	6938	79.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1995 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		0			14	
C. Inspection, maintenance or repair combined with refuelling	1821			960		
D. Inspection, maintenance or repair without refuelling				6		
E. Testing of plant systems or components					0	
L. Human factor related					0	
Subtotal	1821	0	0	966	14	0
Total	1821			980		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1995 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	0	1
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		2
35. All other I&C Systems		1
41. Main Generator Systems		0
42. Electrical Power Supply Systems		6
Total	0	12

## KR-12 HANBIT-4

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: DHICKAEC (DOOSAN HEAVY INDUSTRIES &amp; CONSTRUCTION CO.LTD./KOREA ATOMICENERGY RESEARCH IN

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 998.0 MW(e)  
 Design Net Capacity: 950.0 MW(e)  
 Design Discharge Burnup: 42700 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6796.6 GW(e)·h  
 Energy Availability Factor: 77.7%  
 Load Factor: 77.7%  
 Operating Factor: 79.8%  
 Energy Unavailability Factor: 22.3%  
 Total Off-line Time: 1771 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	344.4	710.9	731.7	703.6	724.4	722.5	699.6	726.0	704.6	728.9	6796.6
EAF (%)	0.0	0.0	46.4	98.9	98.5	97.9	97.6	97.3	97.4	97.8	98.1	98.2	77.7
UCF (%)	0.0	0.0	46.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.3
LF (%)	0.0	0.0	46.4	98.9	98.5	97.9	97.6	97.3	97.4	97.8	98.1	98.2	77.7
OF (%)	0.0	0.0	52.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.8
EUUF (%)	100.0	100.0	53.6	1.1	1.5	2.1	2.4	2.7	2.6	2.2	1.9	1.8	22.3
PUF (%)	100.0	100.0	53.2	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	20.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.4	1.1	1.5	2.0	2.4	2.7	2.6	2.2	1.9	1.8	1.6

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

REFUELING AND MAINTENANCE( - 2014.3.15 22:33)

### 5. Historical Summary

Date of Construction Start: 26 May 1990      Lifetime Generation: 148797.0 GW(e)·h  
 Date of First Criticality: 07 Jul 1995      Cumulative Energy Availability Factor: 89.1%  
 Date of Grid Connection: 18 Jul 1995      Cumulative Load Factor: 90.8%  
 Date of Commercial Operation: 01 Jan 1996      Cumulative Unit Capability Factor: 89.3%  
 Cumulative Energy Unavailability Factor: 10.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1996	7197.5	950	83.5	83.5	83.5	83.5	86.3	86.3	7565	86.1
1997	6767.7	950	78.8	81.1	78.8	81.1	81.3	83.8	7125	81.3
1998	8427.3	950	97.1	86.5	97.1	86.5	101.3	89.6	8591	98.1
1999	7627.9	950	89.0	87.1	89.0	87.1	91.7	90.1	7883	90.0
2000	7252.3	950	84.6	86.6	84.6	86.6	86.9	89.5	7441	84.7
2001	7237.2	950	84.8	86.3	84.8	86.3	87.0	89.1	7424	84.7
2002	7653.5	950	88.7	86.6	88.7	86.6	92.0	89.5	7808	89.1
2003	8576.8	950	98.7	88.1	98.7	88.1	103.1	91.2	8652	98.8
2004	7624.9	950	88.3	88.2	88.3	88.2	91.4	91.2	7782	88.6
2005	7755.0	950	89.8	88.3	89.8	88.3	93.2	91.4	7879	89.9
2006	8646.2	988	100.0	89.4	100.0	89.4	99.9	92.2	8760	100.0
2007	7651.1	987	88.4	89.3	87.8	89.3	88.5	91.9	7790	88.9
2008	7992.6	994	91.4	89.5	91.4	89.5	91.5	91.8	8084	92.0
2009	7694.3	994	88.1	89.4	88.1	89.3	88.4	91.6	7768	88.7
2010	8760.6	994	100.0	90.1	99.9	90.1	100.6	92.2	8760	100.0
2011	7923.2	994	91.0	90.2	90.4	90.1	91.0	92.1	8005	91.4
2012	7705.1	996	87.8	90.0	87.7	89.9	88.1	91.9	7765	88.4
2013	7563.6	997	86.8	89.9	86.4	89.7	86.6	91.6	7618	87.0
2014	6796.6	998	79.3	89.3	77.7	89.1	77.7	90.8	6989	79.8

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost	1996 to 2014 Average Hours Lost Per Year
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	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					31	
C. Inspection, maintenance or repair combined with refuelling	1774			761		
L. Human factor related					0	
Subtotal	1774	0	0	761	31	0
Total	1774			792		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1996 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		4
14. Safety Systems		6
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		1
41. Main Generator Systems		5
42. Electrical Power Supply Systems		10
Total	0	28

## KR-17 HANBIT-5

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: DHICKOPC (DOOSAN HEAVY INDUSTRIES &amp; CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAN

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 994.0 MW(e)  
 Design Net Capacity: 950.0 MW(e)  
 Design Discharge Burnup: 13820 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6918.1 GW(e)·h  
 Energy Availability Factor: 79.2%  
 Load Factor: 79.5%  
 Operating Factor: 79.7%  
 Energy Unavailability Factor: 20.8%  
 Total Off-line Time: 1776 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	346.8	721.0	743.6	715.6	734.6	736.7	714.0	741.9	719.8	743.9	6918.1
EAF (%)	0.0	0.0	46.7	100.0	100.0	99.9	99.3	99.6	99.8	100.0	100.0	100.0	79.2
UCF (%)	0.0	0.0	46.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.3
LF (%)	0.0	0.0	46.9	100.7	100.6	100.0	99.3	99.6	99.8	100.3	100.6	100.6	79.5
OF (%)	0.0	0.0	51.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.7
EUUF (%)	100.0	100.0	53.3	0.0	0.0	0.1	0.7	0.4	0.2	0.0	0.0	0.0	20.8
PUF (%)	100.0	100.0	53.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.1	0.7	0.4	0.2	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE NINTH REFUELING &amp; MAINTENANCE FROM 2013-12-12 TO 2014-03-15.

### 5. Historical Summary

Date of Construction Start: 29 Jun 1997      Lifetime Generation: 96798.2 GW(e)·h  
 Date of First Criticality: 24 Nov 2001      Cumulative Energy Availability Factor: 86.8%  
 Date of Grid Connection: 19 Dec 2001      Cumulative Load Factor: 87.9%  
 Date of Commercial Operation: 21 May 2002      Cumulative Unit Capability Factor: 86.9%  
    Cumulative Energy Unavailability Factor: 13.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2002	5006.8	950	98.7	98.7	98.7	98.7	102.6	102.6	5095	99.2
2003	6694.4	950	77.1	85.1	77.1	85.1	80.4	88.6	6856	78.3
2004	5524.5	950	63.3	76.7	63.3	76.7	66.2	79.9	5611	63.9
2005	7748.4	950	89.0	80.1	88.8	80.1	93.1	83.6	7873	89.9
2006	7688.3	987	88.8	82.1	88.8	82.0	88.9	84.8	7859	89.7
2007	8601.7	990	99.1	85.2	99.1	85.2	99.2	87.4	8725	99.6
2008	7807.4	988	90.2	86.0	90.2	85.9	90.0	87.8	7972	90.8
2009	7857.5	988	90.6	86.6	90.6	86.6	90.8	88.2	7987	91.2
2010	8457.7	988	97.3	87.9	97.1	87.8	97.7	89.4	8528	97.4
2011	8183.8	988	93.9	88.5	93.9	88.5	94.6	89.9	8283	94.6
2012	6244.6	993	71.6	86.9	71.4	86.8	71.6	88.1	6428	73.2
2013	8191.5	997	94.3	87.5	93.8	87.4	93.8	88.6	8290	94.6
2014	6918.1	994	79.3	86.9	79.2	86.8	79.5	87.9	6984	79.7

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2002 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					155	
C. Inspection, maintenance or repair combined with refuelling	1776			738		
D. Inspection, maintenance or repair without refuelling				30		



E. Testing of plant systems or components					2	
Subtotal	1776	0	0	768	157	0
Total	1776			925		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2002 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		3
16. Steam generation systems		16
35. All other I&C Systems		19
42. Electrical Power Supply Systems		103
Total	0	153

## KR-18 HANBIT-6

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAN

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 993.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 13450 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7110.4 GW(e)·h  
**Energy Availability Factor:** 81.6%  
**Load Factor:** 81.7%  
**Operating Factor:** 82.6%  
**Energy Unavailability Factor:** 18.4%  
**Total Off-line Time:** 1525 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	738.9	668.3	740.5	716.9	338.9	0.0	264.5	733.4	710.9	739.0	717.6	741.5	7110.4
<b>EAF (%)</b>	99.9	99.9	100.0	100.0	45.8	0.0	35.8	99.3	99.4	99.9	100.0	100.0	81.6
<b>UCF (%)</b>	99.9	99.9	100.0	100.0	45.8	0.0	36.1	100.0	100.0	100.0	100.0	100.0	81.7
<b>LF (%)</b>	100.0	100.1	100.2	100.3	45.9	0.0	35.8	99.3	99.4	100.0	100.4	100.4	81.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	49.7	0.0	42.1	100.0	100.0	100.0	100.0	100.0	82.6
<b>EUf (%)</b>	0.1	0.1	0.0	0.0	54.2	100.0	64.2	0.7	0.6	0.1	0.0	0.0	18.4
<b>PUf (%)</b>	0.1	0.1	0.0	0.0	54.2	100.0	63.9	0.0	0.0	0.0	0.0	0.0	18.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.7	0.6	0.1	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE NINTH REFUELING & MAINTENANCE FROM 2014-05-16 TO 2014-07-18

### 5. Historical Summary

**Date of Construction Start:** 20 Nov 1997 **Lifetime Generation:** 94054.3 GW(e)·h  
**Date of First Criticality:** 01 Sep 2002 **Cumulative Energy Availability Factor:** 89.0%  
**Date of Grid Connection:** 16 Sep 2002 **Cumulative Load Factor:** 89.1%  
**Date of Commercial Operation:** 24 Dec 2002 **Cumulative Unit Capability Factor:** 89.2%  
**Cumulative Energy Unavailability Factor:** 11.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2002	524.3	996	100.0	100.0	100.0	100.0	70.7	70.7	543	73.0
2003	7652.2	950	88.2	89.2	88.2	89.2	92.0	90.2	7728	88.2
2004	6354.5	950	72.8	81.3	72.8	81.3	76.1	83.5	6449	73.4
2005	7137.1	950	89.1	83.8	88.8	83.7	85.8	84.2	7906	90.3
2006	7988.6	993	91.5	85.8	91.5	85.7	91.8	86.1	8064	92.1
2007	7859.2	993	90.4	86.7	90.1	86.6	90.3	87.0	7957	90.8
2008	7914.6	996	91.1	87.4	90.9	87.3	90.5	87.6	8073	91.9
2009	8501.4	996	97.9	89.0	97.6	88.8	97.4	89.0	8606	98.2
2010	7961.4	996	91.5	89.3	91.2	89.1	91.2	89.3	8060	92.0
2011	8090.6	996	92.9	89.7	92.7	89.5	92.7	89.7	8179	93.4
2012	7231.2	993	83.0	89.0	82.7	88.8	82.9	89.0	7325	83.4
2013	8531.7	995	98.0	89.8	97.7	89.6	97.9	89.8	8631	98.5
2014	7110.4	993	81.7	89.2	81.6	89.0	81.7	89.1	7235	82.6

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2003 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					34	
C. Inspection, maintenance or repair combined with refuelling	1525			745		
D. Inspection, maintenance or repair without refuelling				7		

R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						0
Subtotal	1525	0	0	752	34	0
Total	1525			786		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2003 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		3
17. Safety I&C Systems (excluding reactor I&C)		6
41. Main Generator Systems		3
42. Electrical Power Supply Systems		17
Total	0	34

**KR-9 HANUL-1****Operator:** KHNP (Korea Hydro and Nuclear Power Co.)**Contractor:** FRAM (FRAMATOME)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 963.0 MW(e)

**Design Net Capacity:** 903.0 MW(e)

**Design Discharge Burnup:** 42500 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 7762.3 GW(e)·h

**Energy Availability Factor:** 91.5%

**Load Factor:** 92.0%

**Operating Factor:** 91.7%

**Energy Unavailability Factor:** 8.5%

**Total Off-line Time:** 727 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	722.6	652.3	722.5	699.1	722.3	198.2	497.6	717.4	693.7	720.1	697.3	719.2	7762.3
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	28.4	69.2	100.0	100.0	100.0	100.0	100.0	91.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	28.4	69.2	100.0	100.0	100.0	100.0	100.0	91.5
<b>LF (%)</b>	100.9	100.8	100.8	100.8	100.8	28.6	69.4	100.1	100.1	100.5	100.6	100.4	92.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	28.5	71.5	100.0	100.0	100.0	100.0	100.0	91.7
<b>EUUF (%)</b>	0.0	0.0	0.0	0.0	0.0	71.6	30.8	0.0	0.0	0.0	0.0	0.0	8.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	71.6	30.8	0.0	0.0	0.0	0.0	0.0	8.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

UNPLANNED LOAD REDUCTIONS AND SHUTDOWN DUE TO ROD CONTROL SYSTEM ABNORMAL (2014.06.09 11:00 ~ 2014.07.11 06:50)

**5. Historical Summary**

**Date of Construction Start:** 26 Jan 1983 **Lifetime Generation:** 187725.9 GW(e)·h

**Date of First Criticality:** 25 Feb 1988 **Cumulative Energy Availability Factor:** 86.9%

**Date of Grid Connection:** 07 Apr 1988 **Cumulative Load Factor:** 87.2%

**Date of Commercial Operation:** 10 Sep 1988 **Cumulative Unit Capability Factor:** 87.2%

**Cumulative Energy Unavailability Factor:** 13.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988			Data not provided							
1989	5205.4	920	66.4	66.4	66.4	66.4	64.6	64.6	5821	66.4
1990	6166.2	920	81.7	74.1	81.7	74.1	76.5	70.6	7156	81.7
1991	7244.3	920	91.0	79.7	91.0	79.7	89.9	77.0	7970	91.0
1992	7020.8	920	87.4	81.6	87.4	81.6	86.9	79.5	7675	87.4
1993	6977.6	920	87.3	82.8	87.3	82.8	86.6	80.9	7651	87.3
1994	6878.5	890	82.0	82.6	82.0	82.6	88.2	82.1	7293	83.3
1995	7153.8	920	85.7	83.1	85.7	83.1	88.8	83.0	7698	87.9
1996	7113.7	920	85.6	83.4	85.4	83.4	88.0	83.7	7631	86.9
1997	6801.0	920	83.7	83.4	82.3	83.3	84.4	83.7	7323	83.6
1998	7643.0	920	94.1	84.5	91.4	84.1	94.8	84.9	8256	94.2
1999	7161.6	920	86.1	84.7	86.1	84.3	88.9	85.2	7639	87.2
2000	7230.8	920	86.8	84.8	86.3	84.4	89.5	85.6	7736	88.1
2001	7022.3	920	85.1	84.9	84.5	84.4	87.1	85.7	7483	85.4
2002	5462.4	920	76.0	84.2	76.0	83.8	67.8	84.4	6052	69.1
2003	6371.6	920	85.2	84.3	85.2	83.9	79.1	84.1	7446	85.0
2004	7420.1	920	89.5	84.6	89.3	84.3	91.8	84.5	7970	90.7
2005	8245.0	920	99.9	85.5	99.8	85.2	102.3	85.6	8760	100.0
2006	7212.8	939	88.1	85.7	87.5	85.3	87.7	85.7	7769	88.7
2007	7262.2	940	88.0	85.8	88.0	85.5	88.2	85.8	7747	88.4
2008	8177.4	945	99.2	86.5	99.1	86.2	98.5	86.5	8747	99.6
2009	7493.1	945	91.0	86.7	91.0	86.4	90.5	86.7	8024	91.6

2010	7437.8	945	90.2	86.9	89.8	86.6	89.8	86.8	7988	91.2
2011	8206.1	945	99.4	87.4	99.1	87.1	99.1	87.4	8730	99.7
2012	6640.1	960	78.9	87.0	78.9	86.8	79.2	87.0	6988	79.6
2013	7233.3	960	85.6	87.0	85.5	86.7	86.0	87.0	7545	86.1
2014	7762.3	963	91.5	87.2	91.5	86.9	92.0	87.2	8033	91.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		726			144	
C. Inspection, maintenance or repair combined with refuelling				835		
D. Inspection, maintenance or repair without refuelling				100		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					8	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Z. Other						2
Subtotal	0	726	0	935	152	4
Total		726			1091	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	726	9
15. Reactor Cooling Systems		2
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		4
41. Main Generator Systems		111
42. Electrical Power Supply Systems		6
Total	726	141

## KR-10 HANUL-2

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 965.0 MW(e)  
 Design Net Capacity: 903.0 MW(e)  
 Design Discharge Burnup: 42500 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7161.6 GW(e)·h  
 Energy Availability Factor: 84.4%  
 Load Factor: 84.7%  
 Operating Factor: 84.8%  
 Energy Unavailability Factor: 15.6%  
 Total Off-line Time: 1330 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	721.9	652.2	722.7	699.5	722.2	697.2	712.2	718.0	693.1	513.0	0.0	309.7	7161.6
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	99.0	100.0	99.8	71.3	0.0	42.9	84.4
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	99.0	100.0	100.0	71.3	0.0	42.9	84.4
LF (%)	100.5	100.6	100.7	100.7	100.6	100.3	99.2	100.0	99.8	71.4	0.0	43.1	84.7
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	72.3	0.0	45.7	84.8
EUUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.2	28.7	100.0	57.1	15.6
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.7	100.0	57.1	15.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

19TH REFUELING (2014.10.23 10:00 ~ 2014.12.17 20:01)

### 5. Historical Summary

Date of Construction Start: 05 Jul 1983      Lifetime Generation: 182880.0 GW(e)·h  
 Date of First Criticality: 25 Feb 1989      Cumulative Energy Availability Factor: 87.6%  
 Date of Grid Connection: 14 Apr 1989      Cumulative Load Factor: 88.8%  
 Date of Commercial Operation: 30 Sep 1989      Cumulative Unit Capability Factor: 87.8%  
 Cumulative Energy Unavailability Factor: 12.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989			Data not provided							
1990	5547.3	920	73.0	73.0	73.0	73.0	68.8	68.8	6395	73.0
1991	6671.2	920	86.8	79.9	86.8	79.9	82.8	75.8	7603	86.8
1992	7076.9	920	87.5	82.4	87.5	82.4	87.6	79.7	7686	87.5
1993	7230.2	920	87.8	83.8	87.8	83.8	89.7	82.2	7693	87.8
1994	6889.7	890	81.5	83.3	81.5	83.3	88.4	83.4	7315	83.5
1995	7810.3	920	93.4	85.0	93.4	85.0	96.9	85.7	8223	93.9
1996	7696.4	920	91.3	85.9	91.0	85.9	95.2	87.1	8151	92.8
1997	7055.2	920	86.0	85.9	84.3	85.7	87.5	87.1	7534	86.0
1998	7388.9	920	88.5	86.2	88.3	86.0	91.7	87.6	7947	90.7
1999	7815.2	920	94.6	87.1	94.5	86.8	97.0	88.6	8748	99.9
2000	6836.8	920	82.5	86.6	82.3	86.4	84.6	88.2	7330	83.4
2001	7268.6	920	90.2	86.9	89.2	86.7	90.2	88.4	7848	89.6
2002	6485.8	920	78.3	86.3	78.3	86.0	80.5	87.8	6939	79.2
2003	7253.8	920	87.1	86.3	87.1	86.1	90.0	87.9	7686	87.7
2004	7253.7	920	88.6	86.5	88.6	86.3	89.8	88.0	7888	89.8
2005	6582.4	920	80.8	86.1	80.7	85.9	81.7	87.6	7218	82.4
2006	7882.5	937	97.0	86.8	96.7	86.6	96.0	88.1	8510	97.1
2007	7391.6	937	90.0	87.0	90.0	86.8	90.1	88.3	7946	90.7
2008	7264.2	942	87.9	87.0	87.9	86.8	87.8	88.2	7752	88.3
2009	8258.3	942	100.0	87.7	100.0	87.5	100.1	88.8	8760	100.0
2010	7506.9	942	90.9	87.8	90.8	87.6	91.0	88.9	7991	91.2
2011	6571.1	942	79.3	87.4	79.3	87.3	79.6	88.5	7003	79.9

2012	8325.5	961	98.4	87.9	98.3	87.8	98.6	89.0	8661	98.6
2013	7446.5	962	88.0	87.9	88.0	87.8	88.4	88.9	7740	88.4
2014	7161.6	965	84.4	87.8	84.4	87.6	84.7	88.8	7430	84.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					98	
C. Inspection, maintenance or repair combined with refuelling	1330			864		
D. Inspection, maintenance or repair without refuelling				50		
E. Testing of plant systems or components					1	
J. Grid limitation, failure or grid unavailability						0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Z. Other						3
Subtotal	1330	0	0	914	99	5
Total		1330			1018	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		51
32. Feedwater and Main Steam System		1
41. Main Generator Systems		42
42. Electrical Power Supply Systems		2
Total	0	96

## KR-13 HANUL-3

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: DHICKOPC (DOOSAN HEAVY INDUSTRIES &amp; CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAN)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 997.0 MW(e)  
 Design Net Capacity: 950.0 MW(e)  
 Design Discharge Burnup: 45800 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3609.5 GW(e)·h  
 Energy Availability Factor: 41.3%  
 Load Factor: 41.3%  
 Operating Factor: 42.7%  
 Energy Unavailability Factor: 58.7%  
 Total Off-line Time: 5021 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	741.8	651.4	135.0	0.0	0.0	0.0	0.0	0.0	0.0	620.6	718.1	742.6	3609.5
EAF (%)	100.0	97.2	18.2	0.0	0.0	0.0	0.0	0.0	0.0	83.7	100.0	100.0	41.3
UCF (%)	100.0	100.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0	83.8	100.0	100.0	41.8
LF (%)	100.0	97.2	18.2	0.0	0.0	0.0	0.0	0.0	0.0	83.7	100.0	100.1	41.3
OF (%)	100.0	100.0	23.9	0.0	0.0	0.0	0.0	0.0	0.0	91.5	100.0	100.0	42.7
EUUF (%)	0.0	2.8	81.8	100.0	100.0	100.0	100.0	100.0	100.0	16.3	0.0	0.0	58.7
PUF (%)	0.0	0.0	79.0	100.0	100.0	100.0	100.0	100.0	100.0	16.2	0.0	0.0	58.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	2.8	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

12TH REFUELING(2014.03.08 ~ 2014.10.03)

### 5. Historical Summary

Date of Construction Start: 21 Jul 1993  
 Date of First Criticality: 21 Dec 1997  
 Date of Grid Connection: 06 Jan 1998  
 Date of Commercial Operation: 11 Aug 1998

Lifetime Generation: 126579.5 GW(e)·h  
 Cumulative Energy Availability Factor: 87.5%  
 Cumulative Load Factor: 87.4%  
 Cumulative Unit Capability Factor: 87.7%  
 Cumulative Energy Unavailability Factor: 12.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1998	3495.9	960	100.0	100.0	100.0	100.0	99.2	99.2	3589	97.7
1999	6918.0	960	81.4	86.9	79.7	85.7	82.3	87.3	7149	81.6
2000	7489.1	960	87.0	87.0	87.0	86.2	88.8	87.9	7734	88.0
2001	7922.2	960	91.3	88.2	91.3	87.7	94.2	89.7	8025	91.6
2002	7031.3	960	89.0	88.4	89.0	88.0	83.6	88.4	7824	89.3
2003	7984.3	960	99.6	90.4	99.6	90.1	94.9	89.6	8758	100.0
2004	7187.6	960	90.0	90.4	90.0	90.1	85.2	88.9	7986	90.9
2005	7651.7	960	87.7	90.0	87.6	89.8	91.0	89.2	7834	89.4
2006	8425.9	994	96.6	90.8	96.6	90.6	96.8	90.1	8501	97.0
2007	7901.9	995	90.3	90.8	90.3	90.6	90.7	90.2	7970	91.0
2008	8034.7	994	91.7	90.9	91.7	90.7	92.0	90.3	8122	92.5
2009	8149.7	994	93.3	91.1	93.2	90.9	93.6	90.6	8225	93.9
2010	8740.7	994	99.9	91.8	99.9	91.6	100.4	91.4	8760	100.0
2011	7873.0	994	90.4	91.7	90.0	91.5	90.4	91.4	7960	90.9
2012	6056.3	994	69.2	90.1	69.1	89.9	69.4	89.8	6130	69.8
2013	8731.8	994	100.0	90.8	99.9	90.6	100.3	90.5	8760	100.0
2014	3609.5	997	41.8	87.7	41.3	87.5	41.3	87.4	3739	42.7

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1999 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					35	



C. Inspection, maintenance or repair combined with refuelling	5021			701		
Subtotal	5021	0	0	701	35	0
Total	5021			736		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1999 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		13
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		2
41. Main Generator Systems		18
Total	0	34

## KR-14 HANUL-4

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: DHICKOPC (DOOSAN HEAVY INDUSTRIES &amp; CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAN

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 999.0 MW(e)

Design Net Capacity: 950.0 MW(e)

Design Discharge Burnup: 46603 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8570.9 GW(e)·h

Energy Availability Factor: 97.9%

Load Factor: 97.9%

Operating Factor: 98.2%

Energy Unavailability Factor: 2.1%

Total Off-line Time: 154 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	745.3	672.2	744.2	720.3	569.1	719.5	743.1	740.8	714.7	740.9	718.4	742.4	8570.9
EAF (%)	100.0	100.0	100.0	100.0	76.5	100.0	99.9	99.7	99.4	99.7	99.9	99.9	97.9
UCF (%)	100.0	100.0	100.0	100.0	76.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.0
LF (%)	100.3	100.1	100.1	100.1	76.6	100.0	100.0	99.7	99.4	99.7	99.9	99.9	97.9
OF (%)	100.0	100.0	100.0	100.0	79.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.2
EUUF (%)	0.0	0.0	0.0	0.0	23.5	0.0	0.1	0.3	0.6	0.3	0.1	0.1	2.1
PUF (%)	0.0	0.0	0.0	0.0	23.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.6	0.3	0.1	0.1	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

SHUTDOWN FOR REPAIR OF MAIN TRANSFORMER('14.5.7 ~ '14.5.13)

### 5. Historical Summary

Date of Construction Start: 01 Nov 1993      Lifetime Generation: 112215.6 GW(e)·h

Date of First Criticality: 14 Dec 1998      Cumulative Energy Availability Factor: 80.1%

Date of Grid Connection: 28 Dec 1998      Cumulative Load Factor: 81.4%

Date of Commercial Operation: 31 Dec 1999      Cumulative Unit Capability Factor: 80.2%

Cumulative Energy Unavailability Factor: 19.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1999			Data not provided							
2000	7042.5	960	81.3	81.3	81.3	81.3	83.5	83.5	7229	82.3
2001	7732.3	960	90.0	85.6	89.9	85.6	91.9	87.7	7880	90.0
2002	7311.3	960	84.0	85.1	83.8	85.0	86.9	87.5	7448	85.0
2003	7922.5	960	91.6	86.7	91.6	86.7	94.2	89.1	8081	92.2
2004	8623.1	960	98.7	89.1	98.7	89.1	102.3	91.8	8700	99.0
2005	8003.0	960	91.5	89.5	91.3	89.4	95.2	92.3	8085	92.3
2006	7886.2	993	89.8	89.6	89.8	89.5	90.7	92.1	7938	90.6
2007	7912.9	992	91.0	89.7	90.3	89.6	91.1	92.0	7998	91.3
2008	8762.8	998	100.0	90.9	100.0	90.8	100.0	92.9	8784	100.0
2009	7924.4	998	90.6	90.9	90.6	90.8	90.6	92.6	8047	91.9
2010	8110.6	998	92.6	91.0	92.6	90.9	92.8	92.7	8149	93.0
2011	6023.7	998	68.8	89.1	68.7	89.1	68.9	90.6	6034	68.9
2012	0.0	998	0.0	82.1	0.0	82.1	0.0	83.5	0	0.0
2013	3307.1	998	37.8	78.9	37.8	78.8	37.8	80.2	3362	38.4
2014	8570.9	999	98.0	80.2	97.9	80.1	97.9	81.4	8606	98.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2000 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					29	
C. Inspection, maintenance or repair				507		

combined with refuelling						
D. Inspection, maintenance or repair without refuelling	153					
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1127		
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Subtotal	153	0	0	1634	29	2
Total	153			1665		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2000 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		6
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		3
41. Main Generator Systems		5
42. Electrical Power Supply Systems		13
Total	0	28

## KR-19 HANUL-5

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: DHICKOPC (DOOSAN HEAVY INDUSTRIES &amp; CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAN

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 998.0 MW(e)  
 Design Net Capacity: 950.0 MW(e)  
 Design Discharge Burnup: 38723 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7349.7 GW(e)·h  
 Energy Availability Factor: 84.0%  
 Load Factor: 84.1%  
 Operating Factor: 84.6%  
 Energy Unavailability Factor: 16.0%  
 Total Off-line Time: 1352 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	677.2	517.0	744.7	717.7	742.7	718.0	741.5	739.0	713.5	739.4	299.1	0.0	7349.7
EAF (%)	90.9	76.9	100.0	99.8	99.9	99.9	99.9	99.5	99.3	99.6	41.6	0.0	84.0
UCF (%)	90.9	76.9	100.0	99.8	100.0	100.0	100.0	100.0	100.0	100.0	43.1	0.0	84.3
LF (%)	91.2	77.1	100.3	99.9	100.0	99.9	99.9	99.5	99.3	99.6	41.6	0.0	84.1
OF (%)	90.9	79.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	44.4	0.0	84.6
EUUF (%)	9.1	23.1	0.0	0.2	0.1	0.1	0.1	0.5	0.7	0.4	58.4	100.0	16.0
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.9	100.0	13.2
UCLF (%)	9.1	23.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6
XUF (%)	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.5	0.7	0.4	1.5	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

AUTOMATIC SCRAMS : '14.01.29~02.06 PLANNED OUTAGE : '14.11.14~'15.01.01

### 5. Historical Summary

Date of Construction Start: 01 Oct 1999      Lifetime Generation: 84436.3 GW(e)·h  
 Date of First Criticality: 28 Nov 2003      Cumulative Energy Availability Factor: 91.5%  
 Date of Grid Connection: 18 Dec 2003      Cumulative Load Factor: 91.3%  
 Date of Commercial Operation: 29 Jul 2004      Cumulative Unit Capability Factor: 91.6%  
 Cumulative Energy Unavailability Factor: 8.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2004	3648.4	960	98.2	98.2	98.2	98.2	86.0	86.0	3669	83.1
2005	7321.6	960	83.8	88.6	83.8	88.6	87.1	86.7	7409	84.6
2006	7882.8	994	90.6	89.4	90.6	89.4	90.5	88.3	7925	90.5
2007	8025.9	995	91.9	90.1	91.9	90.1	92.1	89.4	8115	92.6
2008	8763.8	1001	100.0	92.4	99.9	92.3	99.7	91.7	8784	100.0
2009	7924.2	1001	90.7	92.1	90.7	92.1	90.4	91.5	7988	91.2
2010	8160.3	997	93.7	92.3	93.2	92.2	93.4	91.8	8245	94.1
2011	8052.7	997	92.1	92.3	92.0	92.2	92.2	91.8	8106	92.5
2012	8773.9	998	100.0	93.2	99.9	93.1	100.1	92.8	8784	100.0
2013	7476.5	996	85.4	92.4	85.4	92.3	85.7	92.1	7544	86.1
2014	7349.7	998	84.3	91.6	84.0	91.5	84.1	91.3	7408	84.6

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2004 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		207			38	
C. Inspection, maintenance or repair combined with refuelling	1144			513		
Subtotal	1144	207	0	513	38	0
Total		1351			551	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2004 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems	207	17
16. Steam generation systems		13
35. All other I&C Systems		1
Total	207	37

## KR-20 HANUL-6

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAI

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 997.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 38829 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7735.0 GW(e)·h  
**Energy Availability Factor:** 88.5%  
**Load Factor:** 88.6%  
**Operating Factor:** 89.2%  
**Energy Unavailability Factor:** 11.5%  
**Total Off-line Time:** 950 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	742.1	669.8	742.3	141.2	320.4	717.9	742.7	740.0	714.5	743.1	719.3	741.7	7735.0
<b>EAF (%)</b>	100.0	99.9	100.0	19.7	43.1	100.0	100.0	99.7	99.5	100.0	100.0	99.8	88.5
<b>UCF (%)</b>	100.0	100.0	100.0	19.7	43.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.6
<b>LF (%)</b>	100.0	100.0	100.1	19.7	43.2	100.0	100.1	99.8	99.5	100.2	100.2	100.0	88.6
<b>OF (%)</b>	100.0	100.0	100.0	21.1	48.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.2
<b>EUf (%)</b>	0.0	0.1	0.0	80.3	56.9	0.0	0.0	0.3	0.5	0.0	0.0	0.2	11.5
<b>PUf (%)</b>	0.0	0.0	0.0	80.3	56.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.0	0.0	0.2	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

PLANT OUTAGE : 2014-04-07~2014-05-17(REFUELING AND MAINTENANCE)

### 5. Historical Summary

**Date of Construction Start:** 29 Sep 2000 **Lifetime Generation:** 79449.0 GW(e)·h  
**Date of First Criticality:** 16 Dec 2004 **Cumulative Energy Availability Factor:** 92.7%  
**Date of Grid Connection:** 07 Jan 2005 **Cumulative Load Factor:** 92.2%  
**Date of Commercial Operation:** 22 Apr 2005 **Cumulative Unit Capability Factor:** 92.8%  
**Cumulative Energy Unavailability Factor:** 7.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2005	6011.0	960	99.0	99.0	99.0	99.0	94.9	94.9	6041	91.5
2006	7409.9	991	86.7	91.8	86.7	91.8	85.4	89.4	7543	86.1
2007	7911.3	994	91.6	91.8	90.9	91.5	90.9	89.9	8022	91.6
2008	8107.9	1001	92.6	92.0	92.6	91.8	92.2	90.5	8168	93.0
2009	8694.5	1001	99.5	93.6	99.5	93.4	99.2	92.4	8724	99.6
2010	7991.0	997	91.5	93.2	91.4	93.1	91.5	92.2	8055	92.0
2011	8090.6	997	92.6	93.1	92.5	93.0	92.6	92.3	8168	93.2
2012	7703.1	997	87.9	92.5	87.8	92.3	88.0	91.7	7763	88.4
2013	8716.4	996	99.9	93.3	99.8	93.2	99.9	92.7	8760	100.0
2014	7735.0	997	88.6	92.8	88.5	92.7	88.6	92.2	7810	89.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2005 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					22	
C. Inspection, maintenance or repair combined with refuelling	949			470		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						5
Subtotal	949	0	0	470	22	5

Total	949	497
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## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2005 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
15. Reactor Cooling Systems		5
41. Main Generator Systems		7
42. Electrical Power Supply Systems		3
Total	0	20

# KR-1 KORI-1

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 576.0 MW(e)

Design Net Capacity: 558.0 MW(e)

Design Discharge Burnup: 42326 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4295.2 GW(e)·h

Energy Availability Factor: 85.1%

Load Factor: 85.1%

Operating Factor: 85.9%

Energy Unavailability Factor: 14.9%

Total Off-line Time: 1235 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	428.1	313.3	0.0	172.4	429.0	414.4	427.8	426.2	411.8	428.0	415.7	428.5	4295.2
EAF (%)	99.9	80.9	0.0	41.5	100.0	99.9	99.8	99.4	99.3	99.8	100.0	100.0	85.1
UCF (%)	99.9	84.9	0.0	41.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.5
LF (%)	99.9	80.9	0.0	41.6	100.1	99.9	99.8	99.5	99.3	99.9	100.2	100.0	85.1
OF (%)	100.0	87.2	0.0	43.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.9
EUf (%)	0.1	19.1	100.0	58.5	0.0	0.1	0.2	0.6	0.7	0.2	0.0	0.0	14.9
PUf (%)	0.0	15.1	100.0	58.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5
UCLF (%)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	4.0	0.0	0.0	0.0	0.1	0.2	0.6	0.7	0.2	0.0	0.0	0.4

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

2014-02-25 10:00~ 2014-04-17 21:00 REFUELING AND MAINTENANCE

## 5. Historical Summary

Date of Construction Start: 27 Apr 1972      Lifetime Generation: 137546.7 GW(e)·h

Date of First Criticality: 19 Jun 1977      Cumulative Energy Availability Factor: 78.1%

Date of Grid Connection: 26 Jun 1977      Cumulative Load Factor: 75.1%

Date of Commercial Operation: 29 Apr 1978      Cumulative Unit Capability Factor: 78.8%

Cumulative Energy Unavailability Factor: 21.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1978	1721.9	555	47.0	47.0	47.0	47.0	47.0	47.0	4383	66.4
1979	2952.2	564	59.8	54.3	59.8	54.3	59.8	54.3	6558	74.9
1980	3258.4	564	79.7	63.6	79.7	63.6	65.8	58.5	6982	79.5
1981	2708.1	564	69.8	65.3	69.8	65.3	54.8	57.5	6092	69.5
1982	3559.2	556	73.1	66.9	73.1	66.9	73.1	60.8	6904	78.8
1983	3065.6	556	70.1	67.5	70.1	67.5	62.9	61.1	6142	70.1
1984	3236.3	556	67.3	67.4	67.3	67.4	66.3	61.9	6321	72.0
1985	3158.9	556	66.0	67.3	64.6	67.1	64.9	62.3	6364	72.6
1986	3279.5	556	72.8	67.9	72.8	67.7	67.3	62.8	6404	73.1
1987	4557.0	556	99.8	71.1	98.9	70.9	93.6	66.0	8653	98.8
1988	2221.0	556	50.6	69.2	50.6	69.0	45.5	64.1	4449	50.6
1989	2735.9	556	59.2	68.4	59.2	68.2	56.2	63.4	5256	60.0
1990	3500.1	556	74.6	68.9	74.6	68.7	71.9	64.1	6536	74.6
1991	4365.5	556	93.6	70.7	93.3	70.5	89.6	65.9	8172	93.3
1992	3640.3	556	76.9	71.1	76.9	70.9	74.5	66.5	6759	76.9
1993	3824.9	556	81.6	71.8	81.4	71.6	78.5	67.3	7131	81.4
1994	3223.4	564	66.2	71.4	65.8	71.2	65.2	67.1	5973	68.2
1995	3969.1	556	99.1	73.0	81.2	71.8	81.5	67.9	8704	99.4
1996	3748.4	556	78.6	73.3	76.6	72.0	76.7	68.4	6936	79.0
1997	3844.2	556	79.0	73.6	78.9	72.4	78.9	68.9	7080	80.8
1998	3783.7	556	78.7	73.8	78.7	72.7	77.7	69.4	6698	76.5
1999	4153.2	556	83.3	74.2	83.3	73.2	85.3	70.1	7418	84.7
2000	4514.3	556	89.2	74.9	89.2	73.9	92.4	71.1	7932	90.3



2001	4636.5	556	92.5	75.6	92.5	74.7	95.2	72.1	8144	93.0
2002	4147.0	556	84.0	76.0	84.0	75.0	85.1	72.6	8000	91.3
2003	4550.2	556	90.9	76.6	90.1	75.6	93.4	73.4	7978	91.1
2004	4637.7	556	92.0	77.1	92.0	76.2	95.0	74.2	8131	92.6
2005	4149.5	556	82.7	77.3	82.7	76.5	85.2	74.6	7304	83.4
2006	4527.3	573	89.7	77.8	89.7	76.9	90.2	75.2	7891	90.1
2007	2142.4	569	100.0	78.5	98.8	77.7	43.0	74.1	3738	42.7
2008	4604.8	576	94.4	79.1	93.2	78.2	91.0	74.6	8090	92.1
2009	4823.8	576	95.7	79.6	95.7	78.8	95.6	75.3	8386	95.7
2010	4902.9	576	97.7	80.2	97.6	79.4	97.2	76.0	8545	97.5
2011	4396.3	576	87.2	80.4	87.0	79.6	87.1	76.3	7690	87.8
2012	2554.4	576	50.6	79.5	50.5	78.7	50.5	75.6	4495	51.2
2013	2515.7	576	49.9	78.7	49.8	77.9	49.9	74.8	4457	50.9
2014	4295.2	576	85.5	78.8	85.1	78.1	85.1	75.1	7525	85.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					286	
C. Inspection, maintenance or repair combined with refuelling	1235			1076		
D. Inspection, maintenance or repair without refuelling				321		
E. Testing of plant systems or components				10	0	
J. Grid limitation, failure or grid unavailability						6
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					3	
M. Governmental requirements or court decisions						133
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
Z. Other						3
Subtotal	1235	0	0	1407	289	146
Total	1235			1842		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		6
15. Reactor Cooling Systems		22
16. Steam generation systems		63
31. Turbine and auxiliaries		21
32. Feedwater and Main Steam System		36
35. All other I&C Systems		0
41. Main Generator Systems		91
42. Electrical Power Supply Systems		43
XX. Miscellaneous Systems		2
Total	0	284

## KR-2 KORI-2

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 640.0 MW(e)  
 Design Net Capacity: 618.0 MW(e)  
 Design Discharge Burnup: 36946 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5127.4 GW(e)·h  
 Energy Availability Factor: 91.2%  
 Load Factor: 91.5%  
 Operating Factor: 91.7%  
 Energy Unavailability Factor: 8.8%  
 Total Off-line Time: 725 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	477.2	430.8	477.2	461.4	478.3	462.2	477.5	378.6	85.1	477.2	462.8	459.1	5127.4
EAF (%)	100.0	100.0	100.0	99.9	100.0	100.0	100.0	79.5	18.5	100.0	100.0	96.2	91.2
UCF (%)	100.0	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	100.2	100.2	100.2	100.1	100.5	100.3	100.3	79.5	18.5	100.2	100.4	96.4	91.5
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.6	20.4	100.0	100.0	100.0	91.7
EUF (%)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	20.5	81.5	0.0	0.0	3.8	8.8
PUF (%)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	81.5	0.0	0.0	3.8	8.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

2014-08-25 15:54 ~ 2014-09-24 21:01 UNPLANNED RX TRIP DUE TO MANUAL STOP OF CWP WHEN IT SUBMERGED. (NATURAL DISASTER)□

### 5. Historical Summary

Date of Construction Start: 04 Dec 1977      Lifetime Generation: 150376.0 GW(e)·h  
 Date of First Criticality: 09 Apr 1983      Cumulative Energy Availability Factor: 86.7%  
 Date of Grid Connection: 22 Apr 1983      Cumulative Load Factor: 88.0%  
 Date of Commercial Operation: 25 Jul 1983      Cumulative Unit Capability Factor: 87.0%  
    Cumulative Energy Unavailability Factor: 13.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983			Data not provided							
1984	4086.4	605	76.1	76.1	76.1	76.1	76.9	76.9	6876	78.3
1985	3731.4	605	69.8	73.0	69.8	73.0	70.4	73.7	6641	75.8
1986	3945.2	605	75.2	73.7	74.8	73.6	74.4	73.9	6555	74.8
1987	4265.4	605	82.1	75.8	81.6	75.6	80.5	75.6	7251	82.8
1988	4504.7	605	82.8	77.2	82.8	77.0	84.8	77.4	7275	82.8
1989	5062.8	605	95.7	80.3	95.7	80.2	95.5	80.4	8387	95.7
1990	4349.9	605	84.3	80.9	84.3	80.7	82.1	80.7	7381	84.3
1991	4554.0	605	85.8	81.5	85.8	81.4	85.9	81.3	7512	85.8
1992	4517.2	605	85.0	81.9	85.0	81.8	85.0	81.7	7469	85.0
1993	4187.0	605	80.5	81.7	80.5	81.6	79.0	81.5	7048	80.5
1994	4693.9	605	86.5	82.2	86.5	82.1	88.6	82.1	7685	87.7
1995	5106.6	605	94.8	83.2	94.7	83.1	96.4	83.3	8370	95.5
1996	4673.9	605	86.1	83.4	86.0	83.4	87.9	83.6	7668	87.3
1997	4620.3	605	86.8	83.7	86.6	83.6	87.2	83.9	7639	87.2
1998	4697.6	605	84.9	83.7	84.9	83.7	88.6	84.2	7541	86.1
1999	4672.2	605	83.6	83.7	83.6	83.7	88.2	84.5	7472	85.3
2000	4914.7	605	90.1	84.1	90.1	84.1	92.5	84.9	7812	88.9
2001	4807.8	605	87.3	84.3	87.3	84.2	90.7	85.3	7650	87.3
2002	5051.2	605	90.6	84.6	90.6	84.6	95.3	85.8	7982	91.1
2003	4844.2	605	86.5	84.7	85.4	84.6	91.4	86.1	7709	88.0
2004	5501.5	605	97.8	85.3	97.8	85.2	103.5	86.9	8602	97.9

2005	5151.5	605	92.1	85.7	92.1	85.6	97.2	87.4	8080	92.2
2006	5099.2	637	90.8	85.9	90.8	85.8	91.4	87.5	7984	91.1
2007	5011.0	637	89.2	86.0	89.2	85.9	89.8	87.6	7886	90.0
2008	4933.9	637	87.6	86.1	87.6	86.0	88.2	87.7	7771	88.5
2009	5176.9	637	92.2	86.3	92.2	86.3	92.8	87.9	8110	92.6
2010	5025.6	637	90.0	86.5	90.0	86.4	90.1	88.0	7921	90.4
2011	5497.8	637	97.8	86.9	97.8	86.8	98.5	88.4	8578	97.9
2012	4703.7	637	84.0	86.8	84.0	86.7	84.1	88.2	7606	86.6
2013	4501.6	639	80.3	86.6	80.3	86.5	80.4	87.9	7118	81.3
2014	5127.4	640	100.0	87.0	91.2	86.7	91.5	88.0	8035	91.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					116	
C. Inspection, maintenance or repair combined with refuelling				871		
D. Inspection, maintenance or repair without refuelling				30		
E. Testing of plant systems or components					0	
J. Grid limitation, failure or grid unavailability						5
L. Human factor related					3	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			725			
Subtotal	0	0	725	901	119	5
Total	725			1025		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		18
15. Reactor Cooling Systems		10
16. Steam generation systems		2
31. Turbine and auxiliaries		33
32. Feedwater and Main Steam System		11
35. All other I&C Systems		0
41. Main Generator Systems		35
42. Electrical Power Supply Systems		4
Total	0	113

## KR-5 KORI-3

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1011.0 MW(e)  
 Design Net Capacity: 1001.0 MW(e)  
 Design Discharge Burnup: 17910 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7384.2 GW(e)·h  
 Energy Availability Factor: 83.3%  
 Load Factor: 83.4%  
 Operating Factor: 83.7%  
 Energy Unavailability Factor: 16.7%  
 Total Off-line Time: 1428 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	754.3	172.4	0.0	517.0	753.8	728.9	752.3	749.4	723.5	750.3	728.5	753.7	7384.2
EAF (%)	100.0	25.3	0.0	71.0	100.0	100.0	99.9	99.6	99.6	100.0	100.0	100.0	83.3
UCF (%)	100.0	25.3	0.0	71.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.4
LF (%)	100.3	25.4	0.0	71.0	100.2	100.1	100.0	99.6	99.4	99.7	100.1	100.2	83.4
OF (%)	100.0	26.5	0.0	73.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.7
EUAF (%)	0.0	74.7	100.0	29.0	0.0	0.0	0.1	0.4	0.4	0.0	0.0	0.0	16.7
PUF (%)	0.0	74.7	100.0	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.4	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

22TH REFUELING AND MAINTENANCE('14.02.08 ~ '14.04.08)

### 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 212797.2 GW(e)·h  
 Date of First Criticality: 01 Jan 1985      Cumulative Energy Availability Factor: 86.6%  
 Date of Grid Connection: 22 Jan 1985      Cumulative Load Factor: 88.8%  
 Date of Commercial Operation: 30 Sep 1985      Cumulative Unit Capability Factor: 86.7%  
    Cumulative Energy Unavailability Factor: 13.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985			Data not provided							
1986	5611.7	895	73.3	73.3	73.3	73.3	71.6	71.6	6529	74.5
1987	5804.8	895	79.1	76.2	78.8	76.0	74.0	72.8	6665	76.1
1988	6119.7	895	79.7	77.4	79.7	77.3	77.8	74.5	7005	79.7
1989	6592.0	895	82.3	78.6	82.3	78.5	84.1	76.9	7206	82.3
1990	6838.1	895	90.4	81.0	90.4	80.9	87.2	79.0	7923	90.4
1991	5902.5	895	75.1	80.0	75.1	79.9	75.3	78.3	6578	75.1
1992	6746.2	895	83.7	80.5	83.7	80.5	85.8	79.4	7349	83.7
1993	7121.8	895	88.1	81.5	88.1	81.4	90.8	80.8	7721	88.1
1994	6545.3	890	79.3	81.2	79.2	81.2	84.0	81.2	7128	81.4
1995	6015.5	895	73.7	80.5	73.7	80.4	76.7	80.7	6863	78.3
1996	7939.7	895	95.4	81.9	95.4	81.8	101.0	82.6	8431	96.0
1997	6051.9	895	73.8	81.2	73.8	81.1	77.2	82.1	6503	74.2
1998	6902.5	895	82.9	81.3	82.8	81.3	88.0	82.6	7325	83.6
1999	7231.8	895	86.3	81.7	86.3	81.6	92.2	83.3	7615	86.9
2000	8094.3	895	95.6	82.6	95.6	82.6	103.0	84.6	8399	95.6
2001	7570.3	895	89.4	83.0	89.4	83.0	96.6	85.3	7881	90.0
2002	7684.8	895	90.9	83.5	90.9	83.5	98.0	86.1	8062	92.0
2003	8387.4	895	100.0	84.4	99.1	84.3	107.0	87.2	8689	99.2
2004	7312.5	895	86.5	84.5	86.5	84.4	93.0	87.5	7630	86.9
2005	7562.2	895	89.4	84.8	89.4	84.7	96.5	88.0	7885	90.0
2006	7461.8	963	88.3	84.9	88.3	84.9	88.5	88.0	7813	89.2
2007	8214.2	964	96.4	85.5	96.4	85.4	97.3	88.5	8503	97.1

2008	7564.4	979	88.9	85.7	88.8	85.6	88.0	88.4	7854	89.4
2009	7599.6	1007	89.0	85.8	89.0	85.7	88.4	88.4	7820	89.3
2010	8799.7	1007	99.6	86.4	99.6	86.4	99.8	88.9	8732	99.7
2011	8025.1	1011	90.6	86.6	90.6	86.5	90.6	89.0	7971	91.0
2012	6933.1	1011	78.0	86.2	77.9	86.2	78.1	88.6	6875	78.3
2013	8861.5	1011	100.0	86.8	99.9	86.7	100.1	89.0	8760	100.0
2014	7384.2	1011	83.4	86.7	83.3	86.6	83.4	88.8	7332	83.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					78	
C. Inspection, maintenance or repair combined with refuelling	1428			909		
D. Inspection, maintenance or repair without refuelling				20		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				31		
H. Nuclear regulatory requirements					4	
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					8	
Subtotal	1428	0	0	960	90	3
Total	1428			1053		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		13
15. Reactor Cooling Systems		2
16. Steam generation systems		3
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		7
35. All other I&C Systems		5
41. Main Generator Systems		31
42. Electrical Power Supply Systems		0
Total	0	74

## KR-6 KORI-4

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1010.0 MW(e)  
 Design Net Capacity: 903.0 MW(e)  
 Design Discharge Burnup: 18210 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7635.1 GW(e)·h  
 Energy Availability Factor: 86.0%  
 Load Factor: 86.3%  
 Operating Factor: 86.5%  
 Energy Unavailability Factor: 14.0%  
 Total Off-line Time: 1181 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	754.1	681.0	753.7	729.4	754.2	729.3	751.4	161.9	83.6	752.2	730.3	754.0	7635.1
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	99.8	21.5	11.5	100.0	100.0	100.0	86.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	99.8	21.5	11.5	100.0	100.0	100.0	86.0
LF (%)	100.4	100.3	100.3	100.3	100.4	100.3	100.0	21.5	11.5	100.1	100.4	100.3	86.3
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	23.9	14.6	100.0	100.0	100.0	86.5
EUAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	78.5	88.5	0.0	0.0	0.0	14.0
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	78.5	88.5	0.0	0.0	0.0	14.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

22TH REFUELLING AND MAINTENANCE

### 5. Historical Summary

Date of Construction Start: 01 Apr 1980      Lifetime Generation: 212030.1 GW(e)·h  
 Date of First Criticality: 26 Oct 1985      Cumulative Energy Availability Factor: 87.8%  
 Date of Grid Connection: 15 Nov 1985      Cumulative Load Factor: 90.3%  
 Date of Commercial Operation: 29 Apr 1986      Cumulative Unit Capability Factor: 88.0%  
 Cumulative Energy Unavailability Factor: 12.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986			Data not provided							
1987	5860.8	895	78.3	78.3	78.0	78.0	74.8	74.8	6707	76.6
1988	5909.1	895	80.7	79.5	79.8	78.9	75.2	75.0	7006	79.8
1989	6177.4	895	77.2	78.7	77.2	78.3	78.8	76.2	6763	77.2
1990	6230.0	895	81.5	79.4	81.5	79.1	79.5	77.0	7140	81.5
1991	6353.0	895	80.4	79.6	80.0	79.3	81.0	77.8	7011	80.0
1992	6652.3	895	82.7	80.1	82.7	79.9	84.6	79.0	7266	82.7
1993	6835.9	895	85.1	80.9	85.1	80.6	87.2	80.1	7456	85.1
1994	7455.1	890	90.0	82.0	90.0	81.8	95.6	82.1	8160	93.2
1995	6950.6	890	89.3	82.8	89.3	82.6	89.2	82.9	7824	89.3
1996	6678.4	895	80.0	82.5	80.0	82.4	84.9	83.1	7147	81.4
1997	7014.2	895	84.4	82.7	84.4	82.5	89.5	83.6	7450	85.0
1998	8433.7	895	100.0	84.1	100.0	84.0	107.6	85.6	8760	100.0
1999	7129.0	895	84.6	84.2	84.6	84.0	90.9	86.0	7451	85.1
2000	7334.4	895	86.2	84.3	86.2	84.2	93.3	86.6	7578	86.3
2001	7615.1	895	90.0	84.7	90.0	84.6	97.1	87.3	7929	90.5
2002	8495.5	895	100.0	85.6	100.0	85.5	108.4	88.6	8760	100.0
2003	7597.0	895	90.5	85.9	89.6	85.8	96.9	89.1	7913	90.3
2004	7378.6	895	86.8	86.0	86.8	85.8	93.9	89.3	7669	87.3
2005	8397.2	895	99.2	86.7	99.2	86.5	107.1	90.3	8695	99.3
2006	7520.4	967	90.7	86.9	90.7	86.8	88.8	90.2	7824	89.3
2007	7500.9	966	88.0	87.0	88.0	86.8	88.6	90.1	7967	90.9
2008	8348.2	977	98.8	87.5	97.6	87.4	97.3	90.5	8674	98.7

2009	7836.8	1007	89.0	87.6	89.0	87.4	89.1	90.4	7779	88.8
2010	8218.2	1007	93.6	87.9	93.5	87.7	93.2	90.5	8217	93.8
2011	8210.9	1009	92.8	88.1	92.8	87.9	92.9	90.6	8227	93.9
2012	8872.0	1007	100.0	88.6	100.0	88.4	100.3	91.0	8784	100.0
2013	6681.3	1010	75.4	88.1	75.3	87.9	75.5	90.4	6680	76.3
2014	7635.1	1010	86.0	88.0	86.0	87.8	86.3	90.3	7579	86.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					27	
C. Inspection, maintenance or repair combined with refuelling	1181			873		
D. Inspection, maintenance or repair without refuelling				20		
E. Testing of plant systems or components					0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				37		
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
Z. Other						0
Subtotal	1181	0	0	930	28	6
Total	1181			964		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
15. Reactor Cooling Systems		3
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		5
41. Main Generator Systems		0
42. Electrical Power Supply Systems		8
Total	0	24

## KR-21 SHIN-KORI-1

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAN

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 999.0 MW(e)  
**Design Net Capacity:** 998.0 MW(e)  
**Design Discharge Burnup:** 38829 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7419.1 GW(e)·h  
**Energy Availability Factor:** 98.2%  
**Load Factor:** 84.8%  
**Operating Factor:** 85.6%  
**Energy Unavailability Factor:** 1.8%  
**Total Off-line Time:** 1263 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	608.5	673.7	745.9	721.1	744.2	717.9	740.5	737.7	712.8	230.0	43.5	743.3	7419.1
<b>EAF (%)</b>	81.6	100.0	100.0	100.0	100.0	99.8	99.6	99.3	99.1	99.7	100.0	100.0	98.2
<b>UCF (%)</b>	81.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4
<b>LF (%)</b>	81.9	100.4	100.4	100.2	100.1	99.8	99.6	99.3	99.1	30.9	6.0	100.0	84.8
<b>OF (%)</b>	87.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	31.2	8.5	100.0	85.6
<b>EUAF (%)</b>	18.4	0.0	0.0	0.0	0.0	0.2	0.4	0.7	0.9	0.3	0.0	0.0	1.8
<b>PUF (%)</b>	18.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.7	0.9	0.3	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

14.01.04 23:18 THE END OF REFUELING AND MAINTENANCE '14.10.10 16:14 AUTOMATIC SCRAM BY SWYD  
MALFUNCTION '14.11.28 11:25 TUBINE-GENENATOR SYCHRONIZATION

### 5. Historical Summary

**Date of Construction Start:** 16 Jun 2006 **Lifetime Generation:** 25723.7 GW(e)·h  
**Date of First Criticality:** 15 Jul 2010 **Cumulative Energy Availability Factor:** 75.5%  
**Date of Grid Connection:** 04 Aug 2010 **Cumulative Load Factor:** 72.1%  
**Date of Commercial Operation:** 28 Feb 2011 **Cumulative Unit Capability Factor:** 75.6%  
**Cumulative Energy Unavailability Factor:** 24.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2011	7795.2	985	98.5	98.5	98.1	98.1	98.7	98.7	7914	98.7
2012	7091.4	997	81.3	89.5	81.2	89.3	81.0	89.4	7220	82.2
2013	2328.1	1000	26.5	67.8	26.5	67.6	26.6	67.7	2338	26.7
2014	7419.1	999	98.4	75.6	98.2	75.5	84.8	72.1	7497	85.6

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2010 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					79	
C. Inspection, maintenance or repair combined with refuelling	95			1517		
E. Testing of plant systems or components				457		
J. Grid limitation, failure or grid unavailability			1171			0
Subtotal	95	0	1171	1974	79	0
Total		1266			2053	

### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2010 to 2014 Average Hours Lost Per Year
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12. Reactor I&C Systems		79
Total	0	79

## KR-22 SHIN-KORI-2

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAI

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 998.0 MW(e)  
**Design Net Capacity:** 995.0 MW(e)  
**Design Discharge Burnup:** 38829 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 8304.9 GW(e)·h  
**Energy Availability Factor:** 96.0%  
**Load Factor:** 95.0%  
**Operating Factor:** 97.2%  
**Energy Unavailability Factor:** 4.0%  
**Total Off-line Time:** 242 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	459.9	673.8	744.2	718.3	740.9	713.6	735.3	731.5	705.4	637.8	709.7	734.3	8304.9
<b>EAF (%)</b>	61.7	100.0	100.0	100.0	99.8	99.3	99.0	98.5	98.2	98.8	98.8	98.9	96.0
<b>UCF (%)</b>	61.7	100.0	100.0	100.0	99.8	99.5	99.5	99.3	99.1	99.0	98.9	98.9	96.2
<b>LF (%)</b>	61.9	100.5	100.2	100.0	99.8	99.3	99.0	98.5	98.2	85.9	98.8	98.9	95.0
<b>OF (%)</b>	67.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.2
<b>EUUF (%)</b>	38.3	0.0	0.0	0.0	0.2	0.7	1.0	1.5	1.8	1.2	1.2	1.1	4.0
<b>PUF (%)</b>	38.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.2	0.5	0.5	0.7	0.9	1.0	1.1	1.1	0.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.7	0.9	0.3	0.2	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 05 Jun 2007 **Lifetime Generation:** 17265.5 GW(e)·h  
**Date of First Criticality:** 27 Dec 2011 **Cumulative Energy Availability Factor:** 74.6%  
**Date of Grid Connection:** 28 Jan 2012 **Cumulative Load Factor:** 73.9%  
**Date of Commercial Operation:** 20 Jul 2012 **Cumulative Unit Capability Factor:** 74.7%  
**Cumulative Energy Unavailability Factor:** 25.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2012	4331.5	997	100.0	100.0	99.8	99.8	98.4	98.4	4414	100.0
2013	3560.3	1000	40.6	60.4	40.6	60.4	40.6	60.0	3569	40.7
2014	8304.9	998	96.2	74.7	96.0	74.6	95.0	73.9	8518	97.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2012 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	246			1730		
E. Testing of plant systems or components				735		
J. Grid limitation, failure or grid unavailability						0
Subtotal	246	0	0	2465	0	0
Total	246			2465		

### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2012 to 2014 Average Hours Lost Per Year

The reactor has not yet completed a full year of commercial operation.

# KR-23 SHIN-WOLSONG-1

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPAI

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 1000.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 38829 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 8611.8 GW(e)·h  
**Energy Availability Factor:** 98.3%  
**Load Factor:** 98.3%  
**Operating Factor:** 99.1%  
**Energy Unavailability Factor:** 1.7%  
**Total Off-line Time:** 83 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	617.9	673.1	745.5	721.0	745.1	719.4	744.8	741.5	715.7	736.1	714.3	737.5	8611.8
<b>EAF (%)</b>	82.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	98.9	99.2	99.1	98.3
<b>UCF (%)</b>	82.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.5
<b>LF (%)</b>	83.1	100.2	100.2	100.1	100.1	99.9	100.1	99.7	99.4	98.9	99.2	99.1	98.3
<b>OF (%)</b>	88.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1
<b>EUUF (%)</b>	17.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.1	0.8	0.9	1.7
<b>PUF (%)</b>	17.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.0	0.8	0.8	0.3

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 20 Nov 2007 **Lifetime Generation:** 16872.3 GW(e)·h  
**Date of First Criticality:** 06 Jan 2012 **Cumulative Energy Availability Factor:** 72.8%  
**Date of Grid Connection:** 27 Jan 2012 **Cumulative Load Factor:** 72.8%  
**Date of Commercial Operation:** 31 Jul 2012 **Cumulative Unit Capability Factor:** 73.0%  
**Cumulative Energy Unavailability Factor:** 27.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2012	4000.3	997	91.4	91.4	90.9	90.9	90.9	90.9	4307	97.5
2013	3295.8	991	37.9	55.9	37.9	55.7	38.0	55.8	3353	38.3
2014	8611.8	1000	98.5	73.0	98.3	72.8	98.3	72.8	8677	99.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2012 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					108	
C. Inspection, maintenance or repair combined with refuelling	85			1730		
D. Inspection, maintenance or repair without refuelling				601		
Subtotal	85	0	0	2331	108	0
Total		85			2439	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2012 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		71
32. Feedwater and Main Steam System		36
Total	0	107

## KR-3 WOLSONG-1

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)  
**Contractor:** AECL (ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 657.0 MW(e)  
**Design Net Capacity:** 643.0 MW(e)  
**Design Discharge Burnup:** 7500 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 0.0 GW(e)·h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>EUUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

PREPARING FOR RE-PERMISSION AFTER OPERATING PERMIT EXPIRED(21-22-2012 ~ CONTINUE) WOLSONG UNIT 1 WAS SHUT DOWN ON NOV.20, 2012 DUE TO EXPIRATION OF DESIGN LIFE(THIRTY YERS). KHNP HAD ALREADY APPLIED OPERATION LICENSE RENEWAL OF UNIT 1 WITH ISSUE PERIODIC SAFETY REVIEW, LIFE ASSESSMENT FOR COMPONENTS AND ENVIRONMENT ASSESSMENT ON DEC. 30, 2009. NUCLEAR SAFETY & SECURITY COMMITTEE, KOREAN GOVERNMENT, IS STILL REVIEWING THE LICENSE RENEWAL OF WOLSONG UNIT 1 ACCORDING TO THE KOREAN ATOMIC LAW. KHNP CAN NOT RE-START UP OF UNIT 1. IT DEPENDS ON NSSC, KOREAN GOVERNMENT.

### 5. Historical Summary

**Date of Construction Start:** 30 Oct 1977 **Lifetime Generation:** 131783.2 GW(e)·h  
**Date of First Criticality:** 21 Nov 1982 **Cumulative Energy Availability Factor:** 79.5%  
**Date of Grid Connection:** 31 Dec 1982 **Cumulative Load Factor:** 74.9%  
**Date of Commercial Operation:** 22 Apr 1983 **Cumulative Unit Capability Factor:** 79.9%  
**Cumulative Energy Unavailability Factor:** 20.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	2507.4	628	60.4	60.4	60.4	60.4	60.5	60.5	5095	77.2
1984	3693.2	629	66.8	64.1	66.8	64.1	66.8	64.1	6202	70.6
1985	5246.5	629	95.7	75.6	94.0	74.9	95.2	75.4	8277	94.5
1986	4420.4	629	80.9	77.0	80.8	76.5	80.2	76.7	7079	80.8
1987	5155.8	629	94.4	80.7	93.9	80.2	93.6	80.2	8185	93.4
1988	4415.3	629	80.1	80.6	80.1	80.1	79.9	80.2	7033	80.1
1989	5053.2	629	68.8	78.8	68.8	78.5	91.7	81.9	8036	91.7
1990	4770.3	629	86.0	79.7	86.0	79.4	86.6	82.5	7532	86.0
1991	5062.0	629	90.5	81.0	90.5	80.7	91.9	83.6	7927	90.5
1992	4843.3	629	85.5	81.4	85.5	81.2	87.7	84.0	7510	85.5
1993	5611.3	629	99.0	83.1	99.0	82.8	101.8	85.6	8671	99.0
1994	4583.1	629	80.5	82.8	80.4	82.6	83.2	85.4	7150	81.6
1995	4647.1	629	80.9	82.7	80.9	82.5	84.3	85.3	7266	82.9
1996	4508.2	629	78.5	82.4	78.0	82.2	81.6	85.1	7029	80.0
1997	5689.6	629	99.6	83.6	99.6	83.3	103.3	86.3	8732	99.7
1998	4360.4	629	76.5	83.1	76.5	82.9	79.1	85.9	6730	76.8
1999	4613.0	629	80.7	83.0	80.7	82.8	83.7	85.7	7087	80.9

2000	4511.6	629	79.0	82.7	79.0	82.6	81.7	85.5	6993	79.6
2001	4622.0	629	81.3	82.7	81.3	82.5	83.9	85.4	7153	81.7
2002	5516.2	629	97.2	83.4	97.1	83.2	100.1	86.2	8543	97.5
2003	4980.0	629	88.1	83.6	88.1	83.5	90.4	86.4	7715	88.1
2004	5027.5	629	89.4	83.9	88.2	83.7	91.0	86.6	7855	89.4
2005	4296.3	629	82.5	83.8	75.9	83.3	78.0	86.2	7261	82.9
2006	4627.6	578	90.2	84.1	90.2	83.6	91.4	86.4	7998	91.3
2007	4721.9	578	88.3	84.2	88.3	83.8	93.3	86.7	7955	90.8
2008	4885.6	597	91.8	84.5	91.8	84.1	93.2	86.9	8387	95.5
2009	1218.3	597	23.2	82.3	23.2	81.9	23.3	84.6	2150	24.5
2010	0.0	597	0.0	79.5	0.0	79.1	0.0	81.7	0	0.0
2011	2821.2	660	48.6	78.3	48.5	77.9	48.8	80.5	4402	50.3
2012	4132.6	657	82.3	78.5	82.3	78.1	71.6	80.2	6280	71.5
2013	0.0	657	100.0	79.2	100.0	78.8	0.0	77.4	0	0.0
2014	0.0	657	100.0	79.9	100.0	79.5	0.0	74.9	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					92	
C. Inspection, maintenance or repair combined with refuelling				557		
D. Inspection, maintenance or repair without refuelling				323		
E. Testing of plant systems or components				3		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				604		
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					5	
M. Governmental requirements or court decisions			8760			304
Z. Other						4
Subtotal	0	0	8760	1487	97	310
Total	8760			1894		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		31
13. Reactor Auxiliary Systems		3
14. Safety Systems		3
15. Reactor Cooling Systems		11
16. Steam generation systems		1
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		7
41. Main Generator Systems		20
42. Electrical Power Supply Systems		2
Total	0	86

## KR-4 WOLSONG-2

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: AECL/DHI (ATOMIC ENERGY OF CANADA LTD./DOOSAN HEAVY INDUSTRY &amp; CONSTRUCTION)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 655.0 MW(e)  
 Design Net Capacity: 652.0 MW(e)  
 Design Discharge Burnup: 7500 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5194.8 GW(e)·h  
 Energy Availability Factor: 90.8%  
 Load Factor: 90.8%  
 Operating Factor: 90.8%  
 Energy Unavailability Factor: 9.2%  
 Total Off-line Time: 806 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	493.5	444.4	491.3	474.8	492.6	472.0	56.3	381.0	461.9	478.8	466.5	481.9	5194.8
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	12.3	79.4	100.0	100.0	100.0	100.0	90.8
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	12.3	79.4	100.0	100.0	100.0	100.0	90.8
LF (%)	101.3	101.0	100.8	100.7	101.1	100.1	11.5	78.8	98.7	99.0	99.7	99.6	90.8
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	11.8	79.8	100.0	100.0	100.0	100.0	90.8
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	87.7	20.6	0.0	0.0	0.0	0.0	9.2
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	87.7	20.6	0.0	0.0	0.0	0.0	9.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

14TH OVERHAUL(2014.7.4 ~ 2014.8.7)-INSPECTION AND MAINTENANCE

### 5. Historical Summary

Date of Construction Start: 22 Jun 1992      Lifetime Generation: 97765.8 GW(e)·h  
 Date of First Criticality: 29 Jan 1997      Cumulative Energy Availability Factor: 91.3%  
 Date of Grid Connection: 01 Apr 1997      Cumulative Load Factor: 93.6%  
 Date of Commercial Operation: 01 Jul 1997      Cumulative Unit Capability Factor: 91.4%  
    Cumulative Energy Unavailability Factor: 8.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1997	2804.3	650	94.7	94.7	94.7	94.7	97.7	97.7	4199	95.1
1998	4788.7	650	81.0	85.6	81.0	85.6	84.1	88.7	7144	81.6
1999	5211.8	650	88.1	86.6	88.1	86.6	91.5	89.8	7754	88.5
2000	5346.8	650	91.5	88.0	91.5	88.0	93.6	90.9	7843	89.3
2001	5585.4	650	93.0	89.1	92.8	89.1	98.1	92.5	8188	93.5
2002	5266.0	650	87.7	88.8	87.7	88.8	92.5	92.5	7717	88.1
2003	5480.6	650	91.2	89.2	91.2	89.2	96.3	93.1	8015	91.5
2004	5465.5	650	90.9	89.4	90.9	89.4	95.7	93.4	8015	91.2
2005	5641.3	650	93.9	90.0	93.9	89.9	99.1	94.1	8243	94.1
2006	5975.8	684	99.3	91.0	99.3	91.0	99.7	94.7	8711	99.4
2007	5618.8	683	90.6	91.0	90.6	90.9	93.9	94.6	7948	90.7
2008	5700.3	710	92.1	91.1	92.0	91.0	91.4	94.3	8081	92.0
2009	5845.9	710	94.2	91.3	93.9	91.3	94.0	94.3	8265	94.3
2010	5774.3	710	93.0	91.5	92.7	91.4	92.8	94.2	8152	93.1
2011	6124.7	710	98.4	92.0	98.4	91.9	98.5	94.5	8760	100.0
2012	5572.9	673	92.8	92.0	92.8	91.9	94.3	94.5	8187	93.2
2013	4797.4	655	82.2	91.4	82.2	91.4	82.9	93.8	7207	82.3
2014	5194.8	650	90.8	91.4	90.8	91.3	90.8	93.6	7954	90.8

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1997 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External

A. Plant equipment problem/failure					16	
C. Inspection, maintenance or repair combined with refuelling				236		
D. Inspection, maintenance or repair without refuelling	799			420		
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Subtotal	799	0	0	656	18	3
Total	799			677		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1997 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		3
16. Steam generation systems		2
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		5
41. Main Generator Systems		1
42. Electrical Power Supply Systems		0
Total	0	13

## KR-15 WOLSONG-3

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: AECL/DHI (ATOMIC ENERGY OF CANADA LTD./DOOSAN HEAVY INDUSTRY &amp; CONSTRUCTION)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 665.0 MW(e)  
 Design Net Capacity: 665.0 MW(e)  
 Design Discharge Burnup: 7296 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 4968.6 GW(e)·h  
 Energy Availability Factor: 84.0%  
 Load Factor: 85.3%  
 Operating Factor: 84.1%  
 Energy Unavailability Factor: 16.0%  
 Total Off-line Time: 1389 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	511.4	461.4	368.9	487.1	504.9	484.6	498.2	493.6	194.1	0.0	462.4	502.1	4968.6
EAF (%)	100.0	100.0	72.9	100.0	100.0	100.0	100.0	100.0	41.0	0.0	95.5	100.0	84.0
UCF (%)	100.0	100.0	72.9	100.0	100.0	100.0	100.0	100.0	41.0	0.0	95.5	100.0	84.0
LF (%)	103.4	103.2	74.6	101.7	102.0	101.2	100.7	99.8	40.5	0.0	96.6	101.5	85.3
OF (%)	100.0	100.0	73.7	100.0	100.0	100.0	100.0	100.0	41.3	0.0	96.4	100.0	84.1
EUAF (%)	0.0	0.0	27.1	0.0	0.0	0.0	0.0	0.0	59.0	100.0	4.5	0.0	16.0
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.0	100.0	4.5	0.0	13.7
UCLF (%)	0.0	0.0	27.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

TRIP BECAUSE OF THE FAILURE OF LIQUID ZONE SYSTEM LEVEL CONTROLLER(2014.03.15 ~ 2014.03.23)

INSPECTION AND MAINTENANCE(2014.09.13 ~ 2014.11.02)

### 5. Historical Summary

Date of Construction Start: 17 Mar 1994      Lifetime Generation: 93574.6 GW(e)·h  
 Date of First Criticality: 19 Feb 1998      Cumulative Energy Availability Factor: 92.2%  
 Date of Grid Connection: 25 Mar 1998      Cumulative Load Factor: 94.0%  
 Date of Commercial Operation: 01 Jul 1998      Cumulative Unit Capability Factor: 92.2%  
    Cumulative Energy Unavailability Factor: 7.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1998	2839.3	650	96.1	96.1	96.1	96.1	98.9	98.9	4257	96.4
1999	4696.7	650	80.2	85.6	80.2	85.6	82.5	88.0	7008	80.0
2000	5925.2	650	99.9	91.3	99.9	91.3	103.8	94.3	8784	100.0
2001	4923.9	650	85.3	89.6	85.3	89.6	86.5	92.1	7409	84.6
2002	5043.3	650	91.8	90.1	91.8	90.1	88.6	91.3	8083	92.3
2003	5579.5	650	93.1	90.6	93.1	90.6	98.0	92.5	8176	93.3
2004	5540.3	650	92.5	90.9	92.2	90.9	97.0	93.2	8152	92.8
2005	5997.9	650	100.0	92.1	100.0	92.1	105.3	94.8	8760	100.0
2006	5617.8	682	93.4	92.3	93.4	92.3	94.0	94.7	8205	93.7
2007	5826.6	681	93.8	92.4	93.8	92.4	97.7	95.0	8239	94.1
2008	5761.1	707	92.7	92.5	92.6	92.4	92.8	94.8	8129	92.5
2009	5882.5	707	94.5	92.7	94.3	92.6	95.0	94.8	8287	94.6
2010	5986.4	707	96.3	93.0	96.2	92.9	96.7	95.0	8433	96.3
2011	6014.4	707	96.5	93.2	96.5	93.2	97.1	95.1	8477	96.8
2012	5460.6	686	88.7	92.9	88.7	92.9	90.6	94.8	7827	89.1
2013	5453.1	684	90.5	92.8	90.4	92.7	91.0	94.6	7937	90.6
2014	4968.6	665	84.0	92.2	84.0	92.2	85.3	94.0	7371	84.1

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1999 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External



A. Plant equipment problem/failure		196			17	
C. Inspection, maintenance or repair combined with refuelling	1193			233		
D. Inspection, maintenance or repair without refuelling				342		
J. Grid limitation, failure or grid unavailability						1
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Subtotal	1193	196	0	575	17	2
Total		1389			594	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1999 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	196	
16. Steam generation systems		0
21. Fuel Handling and Storage Facilities		2
35. All other I&C Systems		15
Total	196	17

## KR-16 WOLSONG-4

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: AECL/DHI (ATOMIC ENERGY OF CANADA LTD./DOOSAN HEAVY INDUSTRY &amp; CONSTRUCTION)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 669.0 MW(e)  
 Design Net Capacity: 669.0 MW(e)  
 Design Discharge Burnup: 7296 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 4970.7 GW(e)·h  
 Energy Availability Factor: 83.3%  
 Load Factor: 84.8%  
 Operating Factor: 83.4%  
 Energy Unavailability Factor: 16.7%  
 Total Off-line Time: 1453 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	513.8	464.0	511.6	493.2	268.3	0.0	240.1	501.8	482.9	500.1	489.5	505.4	4970.7
EAF (%)	100.0	100.0	100.0	100.0	52.6	0.0	47.6	100.0	100.0	100.0	100.0	100.0	83.3
UCF (%)	100.0	100.0	100.0	100.0	52.6	0.0	47.6	100.0	100.0	100.0	100.0	100.0	83.3
LF (%)	103.2	103.2	102.8	102.4	53.9	0.0	48.2	100.8	100.3	100.5	101.6	101.5	84.8
OF (%)	100.0	100.0	100.0	100.0	52.8	0.0	48.7	100.0	100.0	100.0	100.0	100.0	83.4
EUf (%)	0.0	0.0	0.0	0.0	47.4	100.0	52.4	0.0	0.0	0.0	0.0	0.0	16.7
PUf (%)	0.0	0.0	0.0	0.0	47.4	100.0	52.3	0.0	0.0	0.0	0.0	0.0	16.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

INSPECTION AND MAINTENANCE(2014.05.17 ~ 2014.07.18) COASTDOWN OPERATION AT 75% REACTOR POWER  
 BY CONDENSER COOLING WATER PUMP TRIP(2014.07.28)

### 5. Historical Summary

Date of Construction Start: 22 Jul 1994      Lifetime Generation: 88697.0 GW(e)·h  
 Date of First Criticality: 10 Apr 1999      Cumulative Energy Availability Factor: 92.9%  
 Date of Grid Connection: 21 May 1999      Cumulative Load Factor: 95.3%  
 Date of Commercial Operation: 01 Oct 1999      Cumulative Unit Capability Factor: 93.0%  
    Cumulative Energy Unavailability Factor: 7.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1999	1489.2	650	99.9	99.9	99.9	99.9	103.8	103.8	2208	100.0
2000	5423.3	650	91.4	93.1	91.4	93.1	95.0	96.7	8033	91.5
2001	5493.2	650	92.6	92.9	92.6	92.9	96.5	96.6	8110	92.6
2002	5448.1	650	90.8	92.2	90.8	92.2	95.7	96.3	7971	91.0
2003	5601.9	650	93.5	92.5	93.5	92.5	98.4	96.8	8225	93.9
2004	5620.9	650	93.2	92.6	93.2	92.6	98.4	97.1	8209	93.5
2005	5657.9	650	93.8	92.8	93.8	92.8	99.4	97.5	8254	94.2
2006	6028.3	685	100.0	93.9	100.0	93.9	100.5	97.9	8760	100.0
2007	5770.4	685	92.8	93.7	92.8	93.7	96.2	97.7	8157	93.1
2008	5861.4	708	94.2	93.8	94.1	93.8	94.2	97.3	8271	94.2
2009	5714.1	708	92.7	93.7	92.4	93.6	92.1	96.8	8079	92.2
2010	5831.2	708	93.8	93.7	93.7	93.6	94.0	96.5	8218	93.8
2011	5828.9	708	93.7	93.7	93.5	93.6	94.0	96.3	8215	93.8
2012	6105.7	694	98.6	94.1	98.6	94.0	100.2	96.6	8702	99.1
2013	5364.4	688	88.5	93.7	88.3	93.6	89.0	96.0	7761	88.6
2014	4970.7	669	83.3	93.0	83.3	92.9	84.8	95.3	7307	83.4

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2000 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					9	

C. Inspection, maintenance or repair combined with refuelling				130		
D. Inspection, maintenance or repair without refuelling	1454			372		
J. Grid limitation, failure or grid unavailability						2
Subtotal	1454	0	0	502	9	2
Total	1454			513		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2000 to 2014 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		3
21. Fuel Handling and Storage Facilities		5
31. Turbine and auxiliaries		0
Total	0	8

# MX-1 LAGUNA VERDE-1

**Operator:** CFE (COMISION FEDERAL DE ELECTRICIDAD)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 665.0 MW(e)  
**Design Net Capacity:** 810.0 MW(e)  
**Design Discharge Burnup:** 43000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 4876.0 GW(e)·h  
**Energy Availability Factor:** 81.8%  
**Load Factor:** 83.7%  
**Operating Factor:** 85.2%  
**Energy Unavailability Factor:** 18.2%  
**Total Off-line Time:** 1298 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	512.8	411.9	223.0	0.0	299.7	510.7	499.0	500.9	483.9	501.3	490.5	442.3	4876.0
<b>EAF (%)</b>	99.6	89.9	45.4	0.0	61.0	99.7	99.7	99.8	99.7	99.6	99.7	87.5	81.8
<b>UCF (%)</b>	99.6	89.9	45.4	0.0	61.0	99.7	99.7	99.8	99.7	99.6	99.7	87.5	81.8
<b>LF (%)</b>	103.6	92.2	45.1	0.0	60.6	106.7	100.9	101.2	101.1	101.2	102.4	89.4	83.7
<b>OF (%)</b>	100.0	93.3	72.1	0.0	66.7	100.0	100.0	100.0	100.0	100.0	100.0	89.4	85.2
<b>EUf (%)</b>	0.4	10.1	54.6	100.0	39.0	0.3	0.3	0.2	0.3	0.4	0.3	12.5	18.2
<b>PUf (%)</b>	0.0	0.5	28.4	100.0	23.4	0.3	0.1	0.2	0.3	0.0	0.3	0.0	12.7
<b>UCLF (%)</b>	0.4	9.6	26.2	0.0	15.6	0.0	0.2	0.0	0.0	0.4	0.0	12.5	5.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

- 05-10. FEBRUARY 26TH, 2014; 06:00 HOURS. TOTAL OUTAGE UNPLANNED TO REPAIR PHASE "B" OF MAIN TRANSFORMER T1.- MARCH 5TH, 2014; 01:40 HOURS. DECREASE POWER AT 60% PTN BY PRESENCE OF ETHYLENE GAS IN PHASE B OF MAIN TRANSFORMER.- MARCH 23TH, 2014; 08:41 HOURS. THE 16TH OUTAGE REFUELING STARTED.- APRIL 01TH, 2014; 00:00 HOURS. THE 16TH OUTAGE REFUELING CONTINUED DURING ALL MONTH.- MAY 07TH, 2014; 08:41 HOURS. OUTAGE EXTENTION BEGAN OF THE 16TH OUTAGE REFUELING.- MAY 10TH, 2014; 01:29 HRS. FINISHED IN 47.7 DAYS THE 16TH OUTAGE REFUELING- MAY 13TH, 2014; 19:32 HRS. MANUAL SCRAM CAUSED BY OIL LEAK IN THE DEHC. - MAY 25TH, 2014; 05:51 HRS. TOTAL OUTAGE UNPLANNED TO REPAIR PHASE "B" OF MAIN TRANSFORMER.- DECEMBER 14TH, 2014; 19:48 HRS. MANUAL SCRAM BY LOST OF VACUUM IN MAIN CONDENSER.

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1976 **Lifetime Generation:** 108581.2 GW(e)·h  
**Date of First Criticality:** 08 Nov 1988 **Cumulative Energy Availability Factor:** 79.5%  
**Date of Grid Connection:** 13 Apr 1989 **Cumulative Load Factor:** 76.6%  
**Date of Commercial Operation:** 29 Jul 1990 **Cumulative Unit Capability Factor:** 80.2%  
**Cumulative Energy Unavailability Factor:** 20.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1990	2227.9	640	79.7	79.7	79.7	79.7	78.8	78.8	3955	89.6
1991	4062.1	640	74.4	76.2	74.4	76.2	72.5	74.6	7022	80.2
1992	3746.4	654	70.4	73.9	70.4	73.9	65.2	70.8	7024	80.0
1993	4724.4	654	90.6	78.7	90.6	78.7	82.5	74.2	7851	89.6
1994	4062.0	628	77.8	78.5	73.8	77.6	73.8	74.1	7095	81.0
1995	4154.1	628	78.1	78.4	75.5	77.3	75.5	74.3	7128	81.4
1996	3442.3	655	68.8	76.9	68.8	75.9	59.8	72.1	6628	75.5
1997	5218.8	615	96.0	79.4	95.9	78.5	96.9	75.2	8577	97.9
1998	4412.5	655	82.2	79.7	81.7	78.9	76.9	75.4	7359	84.0
1999	4451.0	670	82.8	80.0	81.5	79.1	75.8	75.5	7466	85.2
2000	4577.6	645	80.6	80.1	80.3	79.3	80.8	76.0	7409	84.3
2001	4144.3	645	74.9	79.6	73.2	78.7	73.3	75.8	6808	77.7
2002	4196.3	680	76.4	79.4	75.8	78.5	70.4	75.3	6876	78.5
2003	5415.4	680	97.9	80.8	97.6	80.0	90.9	76.5	8642	98.7
2004	4168.9	680	75.9	80.5	75.2	79.6	69.8	76.0	6818	77.6

2005	5007.8	680	88.8	81.0	88.2	80.2	84.1	76.6	7884	90.0
2006	5529.7	680	97.5	82.1	97.5	81.3	92.8	77.6	8624	98.4
2007	5027.2	680	89.6	82.5	89.4	81.8	84.4	78.0	7963	90.9
2008	3797.8	650	68.4	81.7	67.9	81.0	66.5	77.4	6169	70.2
2009	5454.5	650	95.0	82.4	95.0	81.7	95.8	78.3	8534	97.4
2010	1886.5	650	42.6	80.5	41.7	79.8	33.1	76.1	3391	38.7
2011	4921.7	650	84.3	80.7	84.2	80.0	86.4	76.6	7598	86.7
2012	3418.6	765	54.2	79.3	51.5	78.5	51.5	75.3	5209	59.3
2013	5719.5	665	97.5	80.1	97.4	79.4	98.2	76.3	8585	98.0
2014	4876.0	665	81.8	80.2	81.8	79.5	83.7	76.6	7461	85.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		147			472	
B. Refuelling without a maintenance				27		
C. Inspection, maintenance or repair combined with refuelling	1079			645	21	
D. Inspection, maintenance or repair without refuelling				188		
E. Testing of plant systems or components				81	5	
J. Grid limitation, failure or grid unavailability						36
L. Human factor related		64			99	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Z. Other					40	
Subtotal	1079	211	0	941	637	38
Total		1290			1616	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		73
13. Reactor Auxiliary Systems		53
14. Safety Systems		6
15. Reactor Cooling Systems		29
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries	102	90
32. Feedwater and Main Steam System		71
33. Circulating Water System		1
35. All other I&C Systems		25
41. Main Generator Systems		21
42. Electrical Power Supply Systems	44	84
Total	146	467

## MX-2 LAGUNA VERDE-2

Operator: CFE (COMISION FEDERAL DE ELECTRICIDAD)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 665.0 MW(e)  
 Design Net Capacity: 810.0 MW(e)  
 Design Discharge Burnup: 43000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 4435.6 GW(e)·h  
 Energy Availability Factor: 74.9%  
 Load Factor: 76.2%  
 Operating Factor: 76.5%  
 Energy Unavailability Factor: 25.1%  
 Total Off-line Time: 2054 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	511.1	461.0	506.4	457.6	458.1	66.5	0.0	352.2	468.8	216.4	420.3	517.1	4435.6
EAF (%)	99.7	99.7	99.6	94.3	93.1	14.9	0.0	71.8	97.8	44.6	87.3	98.9	74.9
UCF (%)	99.7	99.7	99.6	94.3	95.6	15.9	0.0	71.8	97.8	44.7	87.3	98.9	75.2
LF (%)	103.3	103.2	102.5	95.7	92.6	13.9	0.0	71.2	97.9	43.7	87.8	104.5	76.2
OF (%)	100.0	100.0	100.0	95.5	95.8	16.5	0.0	76.9	100.0	45.8	90.3	100.0	76.5
EUf (%)	0.3	0.3	0.4	5.7	6.9	85.1	100.0	28.2	2.2	55.4	12.7	1.1	25.1
PUF (%)	0.3	0.3	0.2	0.4	0.1	84.1	48.3	3.0	0.0	18.7	1.1	0.1	13.1
UCLF (%)	0.0	0.0	0.2	5.4	4.2	0.0	51.7	25.2	2.2	36.5	11.6	1.1	11.7
XUF (%)	0.0	0.0	0.0	0.0	2.5	1.0	0.0	0.0	0.0	0.1	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

-APRIL 10TH, 2014; 03:34 HOURS. AUTOMATIC SCRAM IN MAIN TURBINE TRIP DUE TO FAILURE IN COMMUNICATION WITH SPEED SENSORS. -MAY 14TH, 2014; 05:43 HRS. AUTOMATIC SCRAM BY FAILURE IN THE OPTIC FIBER CONNECTOR OF THE SEL 25-05 RELAY IN SUBSTATION 400KV. -JUNE 23TH, 2014; 23:32 HOURS. THE 13TH OUTAGE REFUELING STARTED. -JULY 15TH, 2014; 23:32 HOURS. BEGAN EXTENSION OF THE 13TH OUTAGE REFUELING. -AUGUST 08TH, 2014; 04:05 HRS. FINISHED THE 13TH OUTAGE REFUELING IN 63.19 DAYS. -OCTOBER 14TH, 2014; 21:06 HRS. TOTAL PLANNED OUTAGE TO CHANGE PHASE A OF MAIN TRANSFORMER. -OCTOBER 20TH, 2014; 16:55 HRS. AUTOMATIC SCRAM BY FAILURE IN THE PHASE "A" OF MAIN TRANSFORMER. -OCTOBER 22TH, 2014; 14:14 HRS. FULL OUTAGE TO CONTINUE REPAIR PUMP 2-N43-P-11A/B. -NOVEMBER 24TH, 2014; 20:37 HRS. TOTAL UNPLANNED OUTAGE TO REPAIR OIL LEAK IN HPU A.

### 5. Historical Summary

Date of Construction Start: 01 Jun 1977      Lifetime Generation: 92190.0 GW(e)·h  
 Date of First Criticality: 06 Sep 1994      Cumulative Energy Availability Factor: 82.6%  
 Date of Grid Connection: 11 Nov 1994      Cumulative Load Factor: 80.0%  
 Date of Commercial Operation: 10 Apr 1995      Cumulative Unit Capability Factor: 83.3%  
    Cumulative Energy Unavailability Factor: 17.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1995	3379.4	628	85.9	85.9	84.5	84.5	84.5	84.5	5687	89.3
1996	3668.4	619	71.7	77.7	71.0	76.7	67.5	74.7	6657	75.8
1997	4805.5	627	89.0	81.9	88.9	81.2	87.5	79.4	7897	90.1
1998	4411.9	655	85.6	82.9	83.0	81.7	76.9	78.7	7609	86.9
1999	5110.6	668	93.3	85.2	92.3	84.0	87.3	80.6	8459	96.6
2000	3339.1	645	58.6	80.5	56.6	79.2	58.9	76.8	5865	66.8
2001	4228.1	645	74.8	79.6	74.7	78.5	74.8	76.5	6952	79.4
2002	5161.0	680	91.5	81.3	91.5	80.3	86.6	77.9	8273	94.4
2003	4604.8	680	82.5	81.4	82.1	80.5	77.3	77.8	7359	84.0
2004	4578.2	680	83.8	81.7	83.0	80.8	76.6	77.7	7449	84.8
2005	5310.3	680	96.9	83.1	96.5	82.3	89.1	78.8	8611	98.3
2006	4870.2	680	90.3	83.8	90.2	83.0	81.8	79.0	8003	91.4
2007	4920.2	680	90.1	84.3	89.9	83.6	82.6	79.3	8013	91.5
2008	5561.0	650	98.3	85.3	98.3	84.6	97.4	80.6	8730	99.4

2009	4653.7	650	82.4	85.1	81.9	84.4	81.7	80.7	7386	84.3
2010	3705.9	650	66.8	84.0	65.4	83.3	65.1	79.7	6289	71.8
2011	4391.6	650	75.9	83.5	75.7	82.8	77.1	79.6	7111	81.2
2012	4993.4	765	74.5	82.9	73.6	82.2	74.3	79.2	6854	78.0
2013	5657.7	665	97.8	83.7	97.8	83.0	97.1	80.2	8522	97.3
2014	4435.6	665	75.2	83.3	74.9	82.6	76.2	80.0	6705	76.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1995 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		959			251	
B. Refuelling without a maintenance				31		
C. Inspection, maintenance or repair combined with refuelling	960			681		
D. Inspection, maintenance or repair without refuelling	131			22		
E. Testing of plant systems or components				44		
J. Grid limitation, failure or grid unavailability						5
L. Human factor related					2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						5
Z. Other					60	
Subtotal	1091	959	0	778	313	10
Total		2050			1101	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1995 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems	53	19
13. Reactor Auxiliary Systems		8
14. Safety Systems		2
15. Reactor Cooling Systems		1
16. Steam generation systems		3
21. Fuel Handling and Storage Facilities		23
31. Turbine and auxiliaries	31	31
32. Feedwater and Main Steam System	243	26
33. Circulating Water System		9
35. All other I&C Systems		1
41. Main Generator Systems		24
42. Electrical Power Supply Systems	631	86
XX. Miscellaneous Systems		3
Total	958	245

## NL-2 BORSSELE

**Operator:** EPZ (N.V. ELEKTRICITEITS-PRODUKTIEMAATSCHAPPIJ ZUID-NEDERLAND)

**Contractor:** S/KWU (SIEMENS/KRAFTWERK UNION AG)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 482.0 MW(e)  
**Design Net Capacity:** 495.0 MW(e)  
**Design Discharge Burnup:** 39000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 3873.5 GW(e)·h  
**Energy Availability Factor:** 91.2%  
**Load Factor:** 91.7%  
**Operating Factor:** 92.0%  
**Energy Unavailability Factor:** 8.8%  
**Total Off-line Time:** 705 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	363.5	284.4	362.3	346.6	306.7	91.2	352.4	352.2	343.3	358.6	349.7	362.6	3873.5
<b>EAF (%)</b>	100.0	86.4	100.0	99.1	85.5	26.3	98.3	98.2	98.9	100.0	100.0	99.8	91.2
<b>UCF (%)</b>	100.0	86.4	100.0	99.1	89.6	27.0	100.0	99.8	99.9	100.0	100.0	99.8	92.0
<b>LF (%)</b>	101.4	87.8	101.2	99.9	85.5	26.3	98.3	98.2	98.9	100.0	100.8	101.1	91.7
<b>OF (%)</b>	100.0	87.4	100.0	100.0	89.5	24.7	100.0	100.0	100.0	100.0	100.0	100.0	92.0
<b>EUf (%)</b>	0.0	13.6	0.0	0.9	14.5	73.7	1.7	1.8	1.1	0.0	0.0	0.2	8.8
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	10.4	34.1	0.0	0.0	0.1	0.0	0.0	0.0	3.7
<b>UCLF (%)</b>	0.0	13.6	0.0	0.9	0.0	39.0	0.0	0.2	0.0	0.0	0.0	0.2	4.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	4.1	0.7	1.7	1.6	1.0	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ON 19TH FEBRUARY, A LEAKAGE OCCURRED IN ONE OF SAFETY VALVES (YP012S003) OF THE PRESSURIZER.

### 5. Historical Summary

**Date of Construction Start:** 01 Jul 1969 **Lifetime Generation:** 138112.5 GW(e)·h  
**Date of First Criticality:** 20 Jun 1973 **Cumulative Energy Availability Factor:** 84.7%  
**Date of Grid Connection:** 04 Jul 1973 **Cumulative Load Factor:** 83.9%  
**Date of Commercial Operation:** 26 Oct 1973 **Cumulative Unit Capability Factor:** 85.1%  
**Cumulative Energy Unavailability Factor:** 15.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	485.9	448	49.2	49.2	49.2	49.2	49.2	49.2	1103	50.0
1974	2993.7	477	71.6	67.4	71.6	67.4	71.6	67.4	6840	78.1
1975	2776.9	447	70.8	68.9	70.8	68.9	70.9	68.9	6494	74.1
1976	3274.4	450	82.8	73.1	82.8	73.1	82.8	73.1	7521	85.6
1977	3142.4	450	80.4	74.8	80.4	74.8	79.7	74.7	7318	83.5
1978	3424.1	445	88.4	77.3	88.4	77.3	87.8	77.1	7997	91.3
1979	2900.0	445	83.5	78.3	83.5	78.3	74.4	76.7	6785	77.5
1980	3593.0	447	92.9	80.3	92.9	80.3	91.5	78.7	8496	96.7
1981	3048.3	447	78.8	80.1	78.8	80.1	77.8	78.6	7094	81.0
1982	3315.9	452	83.9	80.5	83.9	80.5	83.7	79.2	7489	85.5
1983	3050.0	452	76.9	80.2	76.9	80.2	77.0	79.0	6959	79.4
1984	3062.0	452	76.6	79.8	76.6	79.8	77.1	78.8	6895	78.5
1985	3261.2	452	83.3	80.1	81.9	80.0	82.4	79.1	7299	83.3
1986	3574.0	452	91.6	81.0	89.9	80.8	90.3	79.9	8053	91.9
1987	2950.9	452	76.6	80.7	74.2	80.3	74.5	79.6	6756	77.1
1988	3032.6	452	76.2	80.4	76.2	80.0	76.4	79.3	6763	77.0
1989	3421.9	481	87.8	80.9	87.8	80.5	81.2	79.5	7711	88.0
1990	2885.9	481	75.6	80.6	75.6	80.2	68.5	78.8	6636	75.8
1991	2728.5	452	69.3	79.9	69.2	79.6	68.9	78.3	6221	71.0
1992	2830.3	452	82.9	80.1	80.6	79.7	71.3	77.9	6412	73.0
1993	3328.2	452	84.3	80.3	83.6	79.9	84.1	78.2	7376	84.2
1994	3322.0	452	84.8	80.5	84.1	80.1	83.9	78.5	7489	85.5
1995	3386.8	452	87.1	80.8	86.8	80.4	85.5	78.8	7654	87.4



1996	3520.3	452	88.3	81.1	88.2	80.7	88.7	79.2	7978	90.8
1997	Data not provided									
1998	"									
1999	3604.2	449	94.2	81.7	94.2	81.3	91.6	79.7	8363	95.5
2000	3699.0	449	93.9	82.1	93.1	81.7	93.8	80.3	8262	94.1
2001	3746.7	449	94.6	82.6	94.6	82.2	95.3	80.8	8404	95.9
2002	3686.9	450	93.8	83.0	93.4	82.6	93.5	81.3	8284	94.6
2003	3788.3	450	95.3	83.4	95.3	83.1	96.1	81.8	8431	96.2
2004	3604.7	450	91.1	83.7	91.1	83.3	91.2	82.1	8073	91.9
2005	3771.9	450	95.9	84.1	95.5	83.7	95.7	82.6	8430	96.2
2006	3272.6	450	85.7	84.2	84.6	83.8	82.5	82.6	7542	86.1
2007	3993.9	482	95.2	84.5	95.1	84.1	94.6	83.0	8346	95.3
2008	3933.6	482	92.6	84.8	92.6	84.4	92.9	83.3	8161	92.9
2009	4017.7	487	95.1	85.1	95.1	84.7	95.5	83.7	8352	95.3
2010	3754.9	482	89.1	85.2	88.9	84.9	88.9	83.8	7807	89.1
2011	3917.2	482	92.9	85.4	92.1	85.1	92.8	84.1	8092	92.4
2012	3706.7	482	87.4	85.5	86.9	85.1	87.5	84.2	7722	87.9
2013	2736.9	482	64.8	84.9	63.7	84.5	64.8	83.6	5737	65.5
2014	3873.5	482	92.0	85.1	91.2	84.7	91.7	83.9	8054	92.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1973 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		367			197	
B. Refuelling without a maintenance				25		
C. Inspection, maintenance or repair combined with refuelling	338			697	14	
D. Inspection, maintenance or repair without refuelling				41		
E. Testing of plant systems or components					20	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				24		
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
Z. Other				15	3	
Subtotal	338	367	0	802	236	6
Total		705			1044	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1973 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		5
14. Safety Systems	282	13
15. Reactor Cooling Systems	85	17
16. Steam generation systems		32
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System		28
33. Circulating Water System		2
41. Main Generator Systems		44
42. Electrical Power Supply Systems		11
XX. Miscellaneous Systems		19
Total	367	191

## PK-2 CHASNUPP-1

**Operator:** PAEC (PAKISTAN ATOMIC ENERGY COMMISSION)  
**Contractor:** CNNC (CHINA NATIONAL NUCLEAR CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 300.0 MW(e)  
**Design Net Capacity:** 300.0 MW(e)  
**Design Discharge Burnup:** 30000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 2178.2 GW(e)·h  
**Energy Availability Factor:** 85.6%  
**Load Factor:** 82.9%  
**Operating Factor:** 84.9%  
**Energy Unavailability Factor:** 14.4%  
**Total Off-line Time:** 1326 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	224.0	187.6	176.7	160.3	0.0	193.6	194.2	211.2	213.1	211.6	214.2	191.7	2178.2
EAF (%)	100.0	100.0	79.0	74.1	0.0	91.9	89.9	100.0	99.4	95.7	99.0	100.0	85.6
UCF (%)	100.0	100.0	79.0	74.3	0.0	92.1	90.0	100.0	99.4	95.7	99.0	100.0	85.6
LF (%)	100.4	93.1	79.2	74.2	0.0	89.6	87.0	94.6	98.7	94.8	99.1	85.9	82.9
OF (%)	100.0	93.5	80.4	75.8	0.0	97.6	91.0	100.0	100.0	96.2	100.0	85.8	84.9
EUUF (%)	0.0	0.0	21.0	25.9	100.0	8.1	10.1	0.0	0.6	4.3	1.0	0.0	14.4
PUF (%)	0.0	0.0	0.0	23.9	100.0	7.9	0.0	0.0	0.6	0.0	0.0	0.0	11.2
UCLF (%)	0.0	0.0	21.1	1.7	0.0	0.0	10.0	0.0	0.0	4.3	1.0	0.0	3.2
XUF (%)	0.0	0.0	0.0	0.2	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

DURING THE REPORTING PERIOD PLANT ACHIEVED OPERATING FACTOR AND LOAD FACTOR OF 84.85% AND 82.89% RESPECTIVELY. PLANT FACED AN AUTO TRIP IN FEBRUARY DUE TO SEVERE LOAD FLUCTUATION. PLANT TRIPPED TWICE IN MARCH DUE TO CONTROL ROD DROP A1-8 AND ONCE DUE TO RCP-A TRIPPED. RFO-9 STARTED IN APRIL AND ENDED IN JUNE. PLANT WAS MANUALLY SHUTDOWN DUE TO LEAKAGE FROM MAIN GENERATOR STATOR COOLING WATER CIRCUIT IN JULY. IN OCTOBER PLANT WAS ON HOUSELOAD OPERATION DUE TO GRID FLUCTUATION AND FINALLY TRIPPED DUE TO SG-A LEVEL HI HI. IN DECEMBER PLANT FACED AUTO TRIP DUE TO LOSS OF OFFSITE POWER.

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1993  
**Date of First Criticality:** 03 May 2000  
**Date of Grid Connection:** 13 Jun 2000  
**Date of Commercial Operation:** 15 Sep 2000

**Lifetime Generation:** 28393.9 GW(e)·h  
**Cumulative Energy Availability Factor:** 75.8%  
**Cumulative Load Factor:** 75.0%  
**Cumulative Unit Capability Factor:** 76.2%  
**Cumulative Energy Unavailability Factor:** 24.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2000	529.2	300	72.2	72.2	72.2	72.2	68.7	68.7	1860	72.4
2001	1581.8	300	62.4	64.7	60.1	62.8	60.2	62.1	5918	67.6
2002	1356.0	300	53.7	59.9	52.2	58.2	51.6	57.5	4790	54.7
2003	1809.8	300	68.9	62.6	68.9	61.4	68.9	61.0	6879	78.5
2004	1750.7	300	68.1	63.9	66.4	62.6	66.4	62.2	5949	67.7
2005	2155.2	300	81.9	67.3	81.9	66.2	82.0	66.0	7458	85.1
2006	2532.9	300	98.2	72.2	98.2	71.3	96.4	70.8	8569	97.8
2007	1949.1	300	75.6	72.7	75.2	71.8	74.2	71.3	6669	76.1
2008	1356.5	300	52.4	70.2	52.3	69.5	51.5	68.9	4795	54.6
2009	2145.9	300	82.8	71.6	82.8	70.9	81.7	70.3	7379	84.2
2010	2095.8	300	80.7	72.5	80.7	71.9	79.7	71.2	7160	81.7
2011	2061.7	300	79.3	73.1	79.3	72.5	78.5	71.8	7008	80.0
2012	2489.3	300	94.8	74.8	94.7	74.3	94.5	73.7	8370	95.3
2013	2189.6	300	84.0	75.5	84.0	75.1	83.3	74.4	7481	85.4
2014	2178.2	300	85.6	76.2	85.6	75.8	82.9	75.0	7434	84.9

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2000 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		248			534	
C. Inspection, maintenance or repair combined with refuelling	929			972	9	
D. Inspection, maintenance or repair without refuelling				90		
E. Testing of plant systems or components				4	1	
J. Grid limitation, failure or grid unavailability			150			99
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						20
L. Human factor related					7	
Z. Other					31	
Subtotal	929	248	150	1066	582	119
Total		1327			1767	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2000 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		31
12. Reactor I&C Systems	116	17
13. Reactor Auxiliary Systems		10
14. Safety Systems		56
15. Reactor Cooling Systems	36	152
16. Steam generation systems		3
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		61
32. Feedwater and Main Steam System	27	33
33. Circulating Water System		10
35. All other I&C Systems		3
41. Main Generator Systems	67	17
42. Electrical Power Supply Systems		134
Total	246	528

## PK-3 CHASNUPP-2

**Operator:** PAEC (PAKISTAN ATOMIC ENERGY COMMISSION)  
**Contractor:** CNNC (CHINA NATIONAL NUCLEAR CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 300.0 MW(e)  
**Design Net Capacity:** 300.0 MW(e)  
**Design Discharge Burnup:** 32000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 2190.4 GW(e)·h  
**Energy Availability Factor:** 83.9%  
**Load Factor:** 83.3%  
**Operating Factor:** 86.1%  
**Energy Unavailability Factor:** 16.1%  
**Total Off-line Time:** 1214 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	228.4	206.4	173.3	190.7	151.5	0.0	191.9	224.7	218.9	191.8	219.5	193.2	2190.4
<b>EAF (%)</b>	100.0	100.0	76.1	87.3	71.7	0.0	85.5	100.0	100.0	99.2	100.0	87.5	83.9
<b>UCF (%)</b>	100.0	100.0	76.1	87.3	71.7	0.0	85.5	100.0	100.0	99.2	100.0	87.5	83.9
<b>LF (%)</b>	102.3	102.4	77.6	88.3	67.9	0.0	86.0	100.7	101.3	85.9	101.6	86.6	83.3
<b>OF (%)</b>	100.0	100.0	77.7	100.0	94.0	0.0	90.6	100.0	100.0	86.2	100.0	85.2	86.1
<b>EUf (%)</b>	0.0	0.0	23.9	12.7	28.3	100.0	14.5	0.0	0.0	0.8	0.0	12.5	16.1
<b>PUf (%)</b>	0.0	0.0	0.8	12.6	28.3	100.0	14.5	0.0	0.0	0.8	0.0	0.0	13.0
<b>UCLF (%)</b>	0.0	0.0	23.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	3.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

DURING THE REPORTING PERIOD PLANT ACHIEVED OPERATION FACTOR AND LOAD FACTOR AS 86.14% AND 83.35% RESPECTIVELY. PLANT WAS MANUALLY TRIPPED IN MARCH 2014 DUE TO SEVER SPARKING FROM CARBON BRUSHES ASSEMBLY OF MAIN GENERATOR ROTOR. PLANT FACED AN AUTO TRIP IN MAY DUE TO LOW CONDENSER VACUUM FOLLOWING TRIPPING OF COOLING WATER PUMPS UPON GRID LOSS. THREE TIMES PLANT TRIPPED WHILE CRITICAL BEFORE GRID CONNECTION (ONE TIME IN JUNE AND TWO TIMES IN JULY). PLANT FACED TWO AUTO TRIPS IN OCTOBER AND DECEMBER DUE TO LOSS OF OFFSITE POWER

### 5. Historical Summary

**Date of Construction Start:** 28 Dec 2005  
**Date of First Criticality:** 22 Feb 2011  
**Date of Grid Connection:** 14 Mar 2011  
**Date of Commercial Operation:** 18 May 2011

**Lifetime Generation:** 7677.9 GW(e)·h  
**Cumulative Energy Availability Factor:** 79.1%  
**Cumulative Load Factor:** 78.5%  
**Cumulative Unit Capability Factor:** 79.1%  
**Cumulative Energy Unavailability Factor:** 20.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2011	1474.4	300	86.2	86.2	86.2	86.2	83.6	83.6	5040	85.7
2012	2215.8	300	83.8	84.7	83.7	84.7	84.1	83.9	7864	89.5
2013	1700.8	300	64.7	77.2	64.7	77.2	64.7	76.7	6308	72.0
2014	2190.4	300	83.9	79.1	83.9	79.1	83.3	78.5	7546	86.1

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2011 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		259			605	
C. Inspection, maintenance or repair combined with refuelling	805			384		
D. Inspection, maintenance or repair without refuelling				27		
J. Grid limitation, failure or grid unavailability			149			35
Subtotal	805	259	149	411	605	35
Total		1213			1051	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2011 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	0	47
15. Reactor Cooling Systems		210
16. Steam generation systems		40
31. Turbine and auxiliaries		63
32. Feedwater and Main Steam System	0	31
41. Main Generator Systems	165	86
42. Electrical Power Supply Systems	93	125
Total	258	602

## PK-1 KANUPP

**Operator:** PAEC (PAKISTAN ATOMIC ENERGY COMMISSION)  
**Contractor:** CGE (CANADIAN GENERAL ELECTRIC)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 90.0 MW(e)  
**Design Net Capacity:** 125.0 MW(e)  
**Design Discharge Burnup:** 8650 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 209.0 GW(e)·h  
**Energy Availability Factor:** 31.3%  
**Load Factor:** 26.5%  
**Operating Factor:** 35.2%  
**Energy Unavailability Factor:** 68.7%  
**Total Off-line Time:** 5677 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	51.8	4.1	0.0	0.0	0.0	0.0	0.0	32.5	21.6	45.8	26.2	27.1	209.0
EAF (%)	83.3	15.2	0.0	0.0	0.0	0.0	0.0	48.5	33.3	76.3	40.4	75.4	31.3
UCF (%)	83.3	15.2	0.0	0.0	0.0	0.0	0.0	48.5	33.3	76.3	40.4	75.4	31.3
LF (%)	77.4	6.8	0.0	0.0	0.0	0.0	0.0	48.5	33.3	68.3	40.4	40.5	26.5
OF (%)	94.1	9.4	0.0	0.0	0.0	0.0	0.0	70.4	45.0	92.1	54.3	53.2	35.2
EUf (%)	16.7	84.8	100.0	100.0	100.0	100.0	100.0	51.5	66.7	23.7	59.6	24.6	68.7
PUf (%)	16.7	84.8	100.0	100.0	100.0	100.0	100.0	29.7	11.6	23.7	14.0	12.8	57.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.8	55.0	0.0	45.7	11.8	11.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

KANUPP OPERATED AT 70-80MWE WITH AN AVAILABILITY FACTOR OF 35.19% GROSS CAPACITY FACTOR 27.12% AND GENERATING 237.58 GWH (GROSS) THE NET GENERATION WAS 208.95 GWH.KANUPP REMAINED SHUTDOWN FOR 180 DAYS AND 18 HOURS FOR PLANNED LONG SHUT DOWN TO EXECUTE MAINTENANCE ACTIVITIES.

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1966 **Lifetime Generation:** 13159.0 GW(e)·h  
**Date of First Criticality:** 01 Aug 1971 **Cumulative Energy Availability Factor:** 31.1%  
**Date of Grid Connection:** 18 Oct 1971 **Cumulative Load Factor:** 28.8%  
**Date of Commercial Operation:** 07 Dec 1972 **Cumulative Unit Capability Factor:** 32.1%  
**Cumulative Energy Unavailability Factor:** 68.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1972	39.4	137	38.7	38.7	38.7	38.7	38.7	38.7	597	80.2
1973	394.8	126	42.6	42.2	35.6	35.9	35.8	36.0	6197	70.7
1974	583.9	126	52.7	47.3	52.7	43.9	52.9	44.1	6749	77.0
1975	494.9	126	44.8	46.5	44.8	44.2	44.8	44.3	6375	72.8
1976	487.3	137	40.5	44.9	40.5	43.3	40.5	43.3	6026	68.6
1977	339.4	126	30.7	42.2	30.7	40.8	30.7	40.9	5290	60.4
1978	228.4	125	20.9	38.8	20.9	37.6	20.9	37.7	4473	51.1
1979	29.6	125	2.7	33.8	2.7	32.8	2.7	32.8	802	9.2
1980	67.9	125	6.2	30.4	6.2	29.6	6.2	29.6	2427	27.6
1981	192.2	125	17.5	29.0	17.5	28.3	17.6	28.3	5379	61.4
1982	70.9	125	6.5	26.8	6.5	26.1	6.5	26.2	1801	20.6
1983	194.0	125	17.7	26.0	17.7	25.4	17.7	25.4	4754	54.3
1984	290.7	137	26.9	26.1	24.9	25.3	24.2	25.3	5592	63.7
1985	262.0	137	22.7	25.8	21.8	25.0	21.8	25.0	3895	44.5
1986	476.2	125	44.0	27.1	43.5	26.3	43.5	26.3	7211	82.3
1987	274.8	125	25.6	27.0	25.1	26.2	25.1	26.2	4541	51.8
1988	171.4	125	16.2	26.3	15.6	25.6	15.6	25.6	2962	33.7
1989	60.9	125	5.6	25.1	5.6	24.4	5.6	24.4	1145	13.1
1990	375.9	125	34.3	25.6	34.3	25.0	34.3	25.0	5331	60.9
1991	370.3	125	34.8	26.1	33.8	25.4	33.8	25.4	6126	69.9

1992	499.7	125	45.5	27.0	45.5	26.4	45.5	26.4	6396	72.8
1993	369.6	125	35.8	27.5	33.8	26.8	33.8	26.7	4620	52.7
1994	523.6	125	53.6	28.6	47.8	27.7	47.8	27.7	7518	85.8
1995	461.0	125	44.0	29.3	42.1	28.3	42.1	28.3	7520	85.8
1996	310.9	125	32.6	29.4	28.3	28.3	28.3	28.3	5291	60.2
1997	386.1	125	36.8	29.7	35.3	28.6	35.3	28.6	6391	73.0
1998	353.4	125	31.3	29.8	29.7	28.6	32.3	28.7	4799	54.8
1999	69.0	125	11.9	29.1	11.9	28.0	6.3	27.9	1046	11.9
2000	368.3	125	34.6	29.3	33.5	28.2	33.5	28.1	5078	57.8
2001	399.5	125	45.1	29.8	36.5	28.5	36.5	28.4	6049	69.1
2002	444.0	125	41.3	30.2	40.5	28.9	40.5	28.8	6601	75.4
2003	0.0	125	0.0	29.3	0.0	28.0	0.0	27.9	0	0.0
2004	183.0	125	25.5	29.1	24.7	27.9	16.7	27.5	6467	73.6
2005	253.6	125	37.7	29.4	37.7	28.2	23.2	27.4	6633	75.7
2006	15.0	125	4.6	28.7	4.6	27.5	1.4	26.6	408	4.7
2007	359.5	125	50.9	29.3	50.9	28.1	32.8	26.8	5989	68.4
2008	384.8	125	63.4	30.2	63.4	29.1	35.0	27.0	5026	57.2
2009	491.3	125	47.8	30.7	47.8	29.6	44.9	27.5	6282	71.7
2010	464.6	125	43.3	31.0	43.3	30.0	42.4	27.9	6063	69.2
2011	210.8	125	23.3	30.8	23.3	29.8	19.2	27.7	2768	31.6
2012	566.4	125	60.4	31.6	60.4	30.6	51.6	28.3	7678	87.4
2013	480.5	90	62.6	32.1	62.6	31.1	60.9	28.8	6802	77.6
2014	209.0	90	31.3	32.1	31.3	31.1	26.5	28.8	3083	35.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		975			1135	
C. Inspection, maintenance or repair combined with refuelling	4282					
D. Inspection, maintenance or repair without refuelling				1463		
E. Testing of plant systems or components				0		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				206		
J. Grid limitation, failure or grid unavailability			420			249
L. Human factor related					56	
P. Fire					2	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				223		
Z. Other				3	68	
Subtotal	4282	975	420	1895	1261	249
Total		5677			3405	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	311	22
12. Reactor I&C Systems		110
13. Reactor Auxiliary Systems		108
14. Safety Systems		14
15. Reactor Cooling Systems		177
16. Steam generation systems	576	243
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		99
31. Turbine and auxiliaries		34
32. Feedwater and Main Steam System		71
33. Circulating Water System		35
41. Main Generator Systems		4
42. Electrical Power Supply Systems	88	111
XX. Miscellaneous Systems		100
Total	975	1128

# RO-1 CERNAVODA-1

Operator: SNN (SOCIETATEA NATIONALA NUCLEARELECTRICA S.A.)

Contractor: AECL (ATOMIC ENERGY OF CANADA LTD.)

## 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 650.0 MW(e)  
 Design Net Capacity: 650.0 MW(e)  
 Design Discharge Burnup: 7100 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5164.4 GW(e)·h  
 Energy Availability Factor: 90.2%  
 Load Factor: 90.7%  
 Operating Factor: 91.7%  
 Energy Unavailability Factor: 9.8%  
 Total Off-line Time: 728 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	484.8	437.7	483.0	465.2	136.8	322.1	472.6	469.6	462.5	487.0	472.1	470.9	5164.4
EAF (%)	99.6	99.6	99.5	99.2	28.1	68.8	98.3	97.2	98.6	99.4	99.4	95.7	90.2
UCF (%)	99.6	99.6	99.5	99.2	28.1	68.9	99.0	99.0	99.0	99.4	99.4	95.8	90.5
LF (%)	100.2	100.2	100.0	99.4	28.3	68.8	97.7	97.1	98.8	100.6	100.9	97.4	90.7
OF (%)	100.0	100.0	100.0	100.0	29.0	74.4	100.0	100.0	100.0	100.0	100.0	97.8	91.7
EUf (%)	0.4	0.4	0.5	0.8	71.9	31.2	1.7	2.8	1.4	0.6	0.6	4.3	9.8
PUf (%)	0.4	0.4	0.5	0.8	71.9	31.2	1.0	1.0	1.0	0.6	0.6	0.6	9.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.7	0.4	0.0	0.0	0.1	0.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE UNIT WAS OPERATED AT FULL POWER IN BASE LOAD MODE.THE ANNUAL PLANED OUTAGE TOOK PLACE BETWEEN MAY 10- JUNE 8. DURING 2014 UNIT1 HAD 2 UNPLANNED OUTAGES WITH EQUIPMENT PROBLEMS.

## 5. Historical Summary

Date of Construction Start: 01 Jul 1982      Lifetime Generation: 93593.0 GW(e)·h  
 Date of First Criticality: 16 Apr 1996      Cumulative Energy Availability Factor: 89.5%  
 Date of Grid Connection: 11 Jul 1996      Cumulative Load Factor: 89.8%  
 Date of Commercial Operation: 02 Dec 1996      Cumulative Unit Capability Factor: 90.3%  
    Cumulative Energy Unavailability Factor: 10.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1996	461.9	647	94.4	94.4	94.4	94.4	99.6	99.6	719	100.0
1997	4953.3	646	87.3	87.9	86.7	87.3	87.5	88.4	7753	88.5
1998	4908.7	655	85.8	86.9	85.2	86.3	85.5	87.0	7585	86.6
1999	4813.0	654	83.8	85.9	83.5	85.4	83.9	86.0	7389	84.3
2000	5053.4	655	87.9	86.4	87.6	85.9	87.8	86.5	7791	88.7
2001	5049.9	655	88.2	86.7	87.5	86.2	88.0	86.8	7717	88.1
2002	5106.2	655	89.1	87.1	88.7	86.6	89.0	87.1	7854	89.7
2003	4541.4	655	86.7	87.1	78.7	85.5	79.1	86.0	7024	80.2
2004	5142.3	655	89.4	87.3	89.1	86.0	89.4	86.4	7892	89.8
2005	5113.0	655	89.6	87.6	89.3	86.3	89.1	86.7	7878	89.9
2006	5178.0	655	90.8	87.9	90.3	86.7	90.2	87.1	7987	91.2
2007	5518.3	655	97.1	88.7	96.5	87.6	96.2	87.9	8527	97.3
2008	4805.5	650	84.6	88.4	83.8	87.3	84.2	87.6	7411	84.4
2009	5661.7	650	99.2	89.2	98.9	88.2	99.4	88.5	8709	99.4
2010	5167.2	650	90.5	89.3	90.2	88.3	90.7	88.6	7982	91.1
2011	5633.1	650	98.9	89.9	98.4	89.0	98.9	89.3	8694	99.2
2012	4948.2	650	87.5	89.8	87.1	88.9	86.7	89.2	7652	87.1
2013	5622.0	650	98.6	90.3	98.2	89.4	98.7	89.7	8681	99.1
2014	5164.4	650	90.5	90.3	90.2	89.5	90.7	89.8	8032	91.7

## 6. Full Outages, Analysis by Cause

	2014 Hours Lost	1997 to 2014
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Outage Cause	2014 Hours Lost			Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		15			188	
D. Inspection, maintenance or repair without refuelling	712			532		
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					19	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						47
Z. Other					6	
Subtotal	712	15	0	532	213	51
Total		727			796	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1997 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		41
13. Reactor Auxiliary Systems		10
14. Safety Systems		4
15. Reactor Cooling Systems		5
21. Fuel Handling and Storage Facilities		11
31. Turbine and auxiliaries		47
32. Feedwater and Main Steam System		17
33. Circulating Water System		0
41. Main Generator Systems	15	21
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems		19
Total	15	183

## RO-2 CERNAVODA-2

Operator: SNN (SOCIETATEA NATIONALA NUCLEARELECTRICA S.A.)

Contractor: AECL (ATOMIC ENERGY OF CANADA LTD.)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 650.0 MW(e)  
 Design Net Capacity: 650.0 MW(e)  
 Design Discharge Burnup: 7100 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 5589.3 GW(e)·h  
 Energy Availability Factor: 98.0%  
 Load Factor: 98.2%  
 Operating Factor: 99.1%  
 Energy Unavailability Factor: 2.0%  
 Total Off-line Time: 80 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	485.3	440.0	486.5	471.1	482.4	461.8	468.4	467.7	444.5	480.0	461.6	440.0	5589.3
EAF (%)	99.8	99.9	99.9	99.8	99.3	98.8	97.0	96.8	95.1	99.3	98.8	91.2	98.0
UCF (%)	99.8	99.9	99.9	99.8	99.6	99.8	99.7	99.8	96.3	99.8	99.4	92.0	98.8
LF (%)	100.4	100.7	100.7	100.7	99.8	98.7	96.8	96.7	95.0	99.1	98.6	91.0	98.2
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.7	100.0	100.0	93.4	99.1
EUf (%)	0.2	0.1	0.1	0.2	0.7	1.2	3.0	3.2	4.9	0.7	1.2	8.8	2.0
PUf (%)	0.2	0.1	0.1	0.2	0.4	0.2	0.3	0.2	0.3	0.2	0.3	8.0	0.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.3	0.0	0.3
XUF (%)	0.0	0.0	0.0	0.0	0.2	1.0	2.7	2.9	1.2	0.5	0.6	0.9	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

NO ANNUAL OUTAGE WAS PLANNED FOR THIS YEAR, THE UNIT WAS OPERATED AT FULL POWER IN BASE LOAD MODE, WITH THE FOLLOWING EXCEPTIONS: 2 UNPLANNED OUTAGES AND ONE POWER REDUCTION AT 96%.

### 5. Historical Summary

Date of Construction Start: 01 Jul 1983      Lifetime Generation: 39240.0 GW(e)·h  
 Date of First Criticality: 06 May 2007      Cumulative Energy Availability Factor: 94.3%  
 Date of Grid Connection: 07 Aug 2007      Cumulative Load Factor: 94.0%  
 Date of Commercial Operation: 31 Oct 2007      Cumulative Unit Capability Factor: 95.1%  
    Cumulative Energy Unavailability Factor: 5.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2007	1182.8	650	95.4	95.4	95.4	95.4	82.4	82.4	1846	83.6
2008	5528.1	650	98.6	98.0	96.9	96.6	96.8	93.9	8669	98.7
2009	5158.2	650	91.3	95.0	90.6	93.9	90.6	92.4	8044	91.8
2010	5537.5	650	97.3	95.7	96.9	94.8	97.3	93.9	8551	97.6
2011	5177.8	650	91.5	94.7	90.7	93.9	90.9	93.2	8052	91.9
2012	5615.3	650	98.8	95.5	98.1	94.7	98.3	94.2	8701	99.1
2013	5073.7	650	89.2	94.5	88.8	93.7	89.1	93.4	7905	90.2
2014	5589.3	650	98.8	95.1	98.0	94.3	98.2	94.0	8680	99.1

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2007 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		21			92	
D. Inspection, maintenance or repair without refuelling	49			228		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					16	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits,						8

flood, storm, lightning, etc.)						
Subtotal	49	21	0	228	108	8
Total	70			344		

#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2007 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		11
15. Reactor Cooling Systems		14
16. Steam generation systems		5
21. Fuel Handling and Storage Facilities		5
31. Turbine and auxiliaries	21	12
32. Feedwater and Main Steam System		5
41. Main Generator Systems		18
42. Electrical Power Supply Systems		20
Total	21	90

# RU-96 BALAKOVO-1

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 7012.5 GW(e)·h  
**Energy Availability Factor:** 80.0%  
**Load Factor:** 84.3%  
**Operating Factor:** 80.8%  
**Energy Unavailability Factor:** 20.0%  
**Total Off-line Time:** 1684 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	759.4	682.6	743.4	367.5	0.0	39.1	733.3	732.2	714.8	750.0	729.7	760.7	7012.5
<b>EAF (%)</b>	99.7	99.8	99.7	54.4	0.0	7.2	100.0	100.0	99.1	100.0	100.0	100.0	80.0
<b>UCF (%)</b>	99.7	99.8	100.0	60.3	0.0	7.2	100.0	100.0	99.1	100.0	100.0	100.0	80.5
<b>LF (%)</b>	107.4	106.9	105.2	53.7	0.0	5.7	103.7	103.6	104.5	106.0	106.7	107.6	84.3
<b>OF (%)</b>	100.0	100.0	100.0	60.3	0.0	9.2	100.0	100.0	100.0	100.0	100.0	100.0	80.8
<b>EUf (%)</b>	0.3	0.2	0.3	45.6	100.0	92.8	0.0	0.0	0.9	0.0	0.0	0.0	20.0
<b>PUf (%)</b>	0.3	0.2	0.0	39.7	100.0	92.8	0.0	0.0	0.0	0.0	0.0	0.0	19.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	0.0	0.0	0.3	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - MARCH, JULY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 324221 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.04.19 TO 2014.06.28. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

## 5. Historical Summary

**Date of Construction Start:** 01 Dec 1980  
**Date of First Criticality:** 12 Dec 1985  
**Date of Grid Connection:** 28 Dec 1985  
**Date of Commercial Operation:** 23 May 1986

**Lifetime Generation:** 166784.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 71.0%  
**Cumulative Load Factor:** 69.3%  
**Cumulative Unit Capability Factor:** 73.1%  
**Cumulative Energy Unavailability Factor:** 29.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	3675.6	950	66.3	66.3	66.3	66.3	65.8	65.8	4171	70.9
1987	4703.7	1000	57.4	60.8	57.4	60.8	53.7	58.4	5302	60.5
1988	6476.9	950	80.9	68.2	80.9	68.2	77.6	65.5	7207	82.0
1989	4473.9	950	56.4	65.0	56.3	65.0	53.8	62.3	5141	58.7
1990	739.1	950	9.1	53.2	9.1	53.2	8.9	51.0	887	10.1
1991	4951.6	950	60.2	54.4	59.8	54.4	59.5	52.5	5780	66.0
1992	6352.3	950	76.4	57.7	76.3	57.6	76.1	56.0	7666	87.3
1993	3326.1	950	46.1	56.2	39.9	55.3	40.0	53.9	4230	48.3
1994	1759.5	950	77.3	58.6	77.3	57.9	21.1	50.2	2307	26.3
1995	2018.0	950	28.6	55.5	28.6	54.8	24.2	47.5	4810	54.9
1996	4872.5	950	86.5	58.4	59.0	55.2	58.4	48.5	5913	67.3
1997	4729.0	950	60.4	58.6	57.2	55.4	56.8	49.2	5818	66.4
1998	4329.8	950	55.8	58.4	52.2	55.1	52.0	49.5	5671	64.7
1999	5141.3	950	65.6	58.9	62.1	55.7	61.8	50.4	6337	72.3
2000	7247.4	950	87.5	60.8	86.5	57.8	86.8	52.8	7705	87.7
2001	7407.9	950	91.6	62.8	88.2	59.7	89.0	55.1	8041	91.8
2002	6785.7	950	86.5	64.2	80.5	60.9	81.5	56.7	7501	85.6
2003	7032.2	950	84.7	65.4	83.1	62.2	84.5	58.3	7460	85.2

2004	6626.4	950	78.2	66.1	78.0	63.0	79.4	59.4	6901	78.6
2005	7312.7	950	86.6	67.1	86.2	64.2	87.9	60.9	7638	87.2
2006	7277.0	950	85.5	68.0	85.2	65.2	87.4	62.1	7517	85.8
2007	7397.3	950	88.0	68.9	86.5	66.2	88.9	63.4	7731	88.3
2008	6810.2	950	82.4	69.5	81.7	66.9	81.6	64.2	7283	82.9
2009	7948.5	950	99.7	70.8	99.6	68.3	95.5	65.5	8760	100.0
2010	6843.3	950	80.4	71.2	80.3	68.7	82.2	66.2	7069	80.7
2011	7469.3	950	86.2	71.7	86.1	69.4	89.8	67.1	7573	86.5
2012	6322.1	950	73.0	71.8	72.9	69.6	75.8	67.4	6424	73.1
2013	8766.8	950	99.6	72.8	99.6	70.6	105.3	68.8	8726	99.6
2014	7012.5	950	80.5	73.1	80.0	71.0	84.3	69.3	7077	80.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					365	
C. Inspection, maintenance or repair combined with refuelling	1685			1250	13	
D. Inspection, maintenance or repair without refuelling				315		
E. Testing of plant systems or components				1	0	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						165
L. Human factor related					9	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						84
Z. Other					27	
Subtotal	1685	0	0	1566	414	250
Total	1685			2230		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		2
15. Reactor Cooling Systems		8
16. Steam generation systems		116
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		52
32. Feedwater and Main Steam System		11
33. Circulating Water System		1
35. All other I&C Systems		9
41. Main Generator Systems		102
42. Electrical Power Supply Systems		23
XX. Miscellaneous Systems		31
Total	0	361

## RU-97 BALAKOVO-2

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6497.7 GW(e)·h  
**Energy Availability Factor:** 75.6%  
**Load Factor:** 78.1%  
**Operating Factor:** 76.2%  
**Energy Unavailability Factor:** 24.4%  
**Total Off-line Time:** 2089 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	76.1	746.7	734.2	704.1	708.8	711.6	728.7	718.7	715.7	551.6	101.5	6497.7
<b>EAF (%)</b>	0.0	13.7	100.0	100.0	95.0	100.0	100.0	100.0	100.0	100.0	80.0	15.3	75.6
<b>UCF (%)</b>	0.0	13.7	100.0	100.0	95.0	100.0	100.0	100.0	100.0	100.0	80.0	15.3	75.6
<b>LF (%)</b>	0.0	11.9	105.6	107.3	99.6	103.6	100.7	103.1	105.1	101.1	80.6	14.4	78.1
<b>OF (%)</b>	0.0	14.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.0	15.7	76.2
<b>EUf (%)</b>	100.0	86.3	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	20.0	84.7	24.4
<b>PUf (%)</b>	100.0	86.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	20.0	84.7	9.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN FEBRUARY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 274121 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 2014.01.01 TO 2014.02.24. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1981  
**Date of First Criticality:** 02 Oct 1987  
**Date of Grid Connection:** 08 Oct 1987  
**Date of Commercial Operation:** 18 Jan 1988

**Lifetime Generation:** 159246.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 70.6%  
**Cumulative Load Factor:** 70.4%  
**Cumulative Unit Capability Factor:** 73.5%  
**Cumulative Energy Unavailability Factor:** 29.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	5978.4	950	76.9	76.9	76.9	76.9	71.6	71.6	6928	78.9
1989	6703.6	950	84.8	80.9	84.8	80.8	80.6	76.1	7626	87.1
1990	5476.7	950	66.5	76.1	66.3	76.0	65.8	72.7	6165	70.4
1991	4308.4	950	51.5	69.9	51.2	69.8	51.8	67.4	4845	55.3
1992	5958.2	950	70.6	70.1	70.6	70.0	71.4	68.2	6601	75.1
1993	3776.2	950	47.0	66.2	44.3	65.7	45.4	64.4	4147	47.3
1994	4778.5	950	83.5	68.7	73.1	66.7	57.4	63.4	8020	91.6
1995	2204.8	950	30.1	63.9	30.1	62.2	26.5	58.8	3261	37.2
1996	2227.3	950	26.7	59.7	26.7	58.2	26.7	55.2	2604	29.6
1997	4015.9	950	63.9	60.2	55.7	58.0	48.3	54.5	6158	70.3
1998	3293.8	950	51.0	59.3	40.2	56.4	39.6	53.2	4984	56.9
1999	2927.1	950	40.3	57.7	35.4	54.6	35.2	51.7	3942	45.0
2000	5730.1	950	83.2	59.7	68.9	55.7	68.7	53.0	7646	87.0
2001	6678.8	950	83.9	61.4	79.9	57.4	80.3	54.9	7415	84.6
2002	6756.5	950	84.4	63.0	80.4	59.0	81.2	56.7	7408	84.6
2003	6171.8	950	74.0	63.7	72.7	59.8	74.2	57.8	6467	73.8
2004	7010.4	950	85.0	64.9	82.4	61.2	84.0	59.3	7514	85.5
2005	6948.9	950	86.9	66.1	82.5	62.3	83.5	60.7	7688	87.8

2006	7237.5	950	87.4	67.2	84.6	63.5	87.0	62.0	7710	88.0
2007	6657.2	950	83.5	68.1	78.7	64.3	80.0	62.9	7327	83.6
2008	7451.2	950	87.8	69.0	87.7	65.4	89.3	64.2	7750	88.2
2009	7630.7	950	88.8	69.9	88.6	66.4	91.7	65.5	7797	89.0
2010	8683.9	950	100.0	71.2	99.9	67.9	104.3	67.1	8760	100.0
2011	7288.4	950	85.8	71.8	85.4	68.6	87.6	68.0	7531	86.0
2012	7706.5	950	89.0	72.5	88.3	69.4	92.4	69.0	7829	89.1
2013	8222.8	950	96.5	73.4	95.6	70.4	98.8	70.1	8509	97.1
2014	6497.7	950	75.6	73.5	75.6	70.6	78.1	70.4	6672	76.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		772			362	
C. Inspection, maintenance or repair combined with refuelling	1318			1442	101	
D. Inspection, maintenance or repair without refuelling				110		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						7
L. Human factor related					4	
Z. Other					16	
Subtotal	1318	772	0	1552	483	7
Total		2090			2042	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		8
15. Reactor Cooling Systems		7
16. Steam generation systems		295
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		18
35. All other I&C Systems		3
41. Main Generator Systems	772	23
42. Electrical Power Supply Systems		1
Total	772	358

## RU-98 BALAKOVO-3

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7746.9 GW(e)·h  
**Energy Availability Factor:** 88.6%  
**Load Factor:** 93.1%  
**Operating Factor:** 89.3%  
**Energy Unavailability Factor:** 11.4%  
**Total Off-line Time:** 934 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	752.4	667.9	750.2	734.0	748.2	685.9	736.9	732.0	701.0	751.2	487.2	0.0	7746.9
<b>EAF (%)</b>	99.0	100.0	100.0	100.0	100.0	97.0	100.0	100.0	97.6	100.0	70.4	0.0	88.6
<b>UCF (%)</b>	99.0	100.0	100.0	100.0	100.0	97.0	100.0	100.0	97.6	100.0	73.6	0.0	88.8
<b>LF (%)</b>	106.4	104.6	106.1	107.3	105.9	100.3	104.3	103.6	102.5	106.1	71.2	0.0	93.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	73.6	0.0	89.3
<b>EUf (%)</b>	1.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	2.4	0.0	29.6	100.0	11.4
<b>PUf (%)</b>	1.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	2.4	0.0	26.4	100.0	11.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - NOVEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 349025 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.11.23 TO 2014.12.31. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Nov 1982  
**Date of First Criticality:** 16 Dec 1988  
**Date of Grid Connection:** 25 Dec 1988  
**Date of Commercial Operation:** 08 Apr 1989

**Lifetime Generation:** 160381.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 74.7%  
**Cumulative Load Factor:** 74.2%  
**Cumulative Unit Capability Factor:** 78.3%  
**Cumulative Energy Unavailability Factor:** 25.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	5483.4	950	88.4	88.4	88.4	88.4	87.4	87.4	6015	91.1
1990	5718.7	950	68.0	76.8	67.8	76.7	68.7	76.8	6696	76.4
1991	5403.4	950	67.1	73.3	64.2	72.1	64.9	72.5	6124	69.9
1992	5545.4	950	66.4	71.4	64.8	70.2	66.4	70.9	6202	70.6
1993	4378.6	950	61.6	69.4	52.7	66.5	52.6	67.0	5461	62.3
1994	3340.1	950	70.7	69.6	70.7	67.2	40.1	62.4	5389	61.5
1995	2674.7	950	53.1	67.2	47.5	64.3	32.1	57.9	5511	62.9
1996	5315.4	950	75.9	68.3	64.3	64.3	63.7	58.6	7085	80.7
1997	2058.8	950	38.8	64.9	25.3	59.9	24.7	54.8	3395	38.8
1998	5348.5	950	73.0	65.8	64.4	60.3	64.3	55.7	7136	81.5
1999	5458.0	950	72.0	66.3	65.6	60.8	65.6	56.7	6552	74.8
2000	6482.9	950	82.0	67.7	77.2	62.2	77.7	58.4	7327	83.4
2001	6050.7	950	78.6	68.5	72.1	63.0	72.7	59.6	6927	79.1
2002	6926.3	950	85.3	69.8	82.0	64.4	83.2	61.3	7478	85.4
2003	7016.1	950	85.1	70.8	83.2	65.6	84.3	62.8	7471	85.3
2004	7227.8	950	86.4	71.8	85.1	66.9	86.6	64.4	7607	86.6
2005	6244.4	950	79.9	72.3	74.5	67.3	75.0	65.0	7060	80.6
2006	7741.8	950	95.3	73.6	91.4	68.7	93.0	66.6	8354	95.4



2007	7407.1	950	91.8	74.5	87.6	69.7	89.0	67.8	8050	91.9
2008	7384.3	950	87.1	75.2	87.0	70.6	88.5	68.8	7693	87.6
2009	6932.7	950	82.6	75.5	82.6	71.1	83.3	69.5	7276	83.1
2010	7649.6	950	87.8	76.1	87.1	71.9	91.9	70.5	7710	88.0
2011	8579.1	950	98.3	77.1	98.3	73.0	103.1	72.0	8627	98.5
2012	7716.2	950	89.3	77.6	89.3	73.7	92.5	72.8	7854	89.4
2013	7378.2	950	84.9	77.9	84.5	74.2	88.7	73.5	7481	85.4
2014	7746.9	950	88.8	78.3	88.6	74.7	93.1	74.2	7827	89.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					89	
C. Inspection, maintenance or repair combined with refuelling	934			1318	25	
D. Inspection, maintenance or repair without refuelling				206		
E. Testing of plant systems or components					1	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						56
L. Human factor related					6	
Z. Other					2	
Subtotal	934	0	0	1524	123	56
Total		934			1703	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		28
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		5
16. Steam generation systems		1
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System		5
33. Circulating Water System		7
35. All other I&C Systems		4
41. Main Generator Systems		5
42. Electrical Power Supply Systems		13
XX. Miscellaneous Systems		6
Total	0	84

## RU-99 BALAKOVO-4

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7204.5 GW(e)·h  
**Energy Availability Factor:** 81.3%  
**Load Factor:** 86.6%  
**Operating Factor:** 81.9%  
**Energy Unavailability Factor:** 18.7%  
**Total Off-line Time:** 1588 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	764.3	676.8	764.0	738.7	755.5	701.2	738.2	289.4	0.0	307.0	706.1	763.2	7204.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	98.1	100.0	41.1	0.0	39.8	97.2	100.0	81.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	98.1	100.0	42.2	0.0	39.8	97.2	100.0	81.4
<b>LF (%)</b>	108.1	106.0	108.1	108.0	106.9	102.5	104.4	40.9	0.0	43.4	103.2	108.0	86.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	42.2	0.0	41.2	100.0	100.0	81.9
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	1.9	0.0	58.9	100.0	60.2	2.8	0.0	18.7
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	1.9	0.0	57.8	100.0	60.2	2.8	0.0	18.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - AUGUST, OCTOBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 395467 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 2014.08.14 TO 2014.10.19. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1984  
**Date of First Criticality:** 24 Mar 1993  
**Date of Grid Connection:** 11 Apr 1993  
**Date of Commercial Operation:** 22 Dec 1993

**Lifetime Generation:** 141960.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 78.4%  
**Cumulative Load Factor:** 79.0%  
**Cumulative Unit Capability Factor:** 82.5%  
**Cumulative Energy Unavailability Factor:** 21.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1993	423.2	950	60.0	60.0	60.0	60.0	59.9	59.9	480	64.5
1994	3828.5	950	69.5	68.8	48.5	49.4	46.0	47.1	4604	52.6
1995	5610.0	950	88.7	78.3	86.5	67.1	67.4	56.8	8760	100.0
1996	4545.5	950	59.9	72.3	55.5	63.4	54.5	56.1	6652	75.7
1997	4637.7	950	71.3	72.1	59.6	62.4	55.7	56.0	6637	75.8
1998	5042.5	950	71.3	71.9	60.9	62.1	60.6	56.9	6936	79.2
1999	5803.9	950	77.5	72.9	69.6	63.4	69.7	59.0	7268	83.0
2000	6665.9	950	81.0	74.0	78.9	65.6	79.9	62.0	7216	82.1
2001	6578.1	950	83.9	75.2	78.3	67.1	79.0	64.1	7354	83.9
2002	6292.9	950	77.3	75.5	72.8	67.8	75.6	65.3	6723	76.7
2003	7223.8	950	85.8	76.5	84.6	69.4	86.8	67.5	7541	86.1
2004	7022.9	950	85.4	77.3	82.5	70.6	84.2	69.0	7540	85.8
2005	6938.3	950	87.6	78.1	82.1	71.6	83.4	70.2	7699	87.9
2006	6805.4	950	82.2	78.4	79.6	72.2	81.8	71.1	7230	82.5
2007	7153.3	950	88.5	79.2	84.7	73.1	86.0	72.1	7787	88.9
2008	8330.4	950	99.7	80.5	99.7	74.8	99.8	73.9	8779	99.9
2009	7410.0	950	87.8	81.0	87.8	75.7	89.0	74.9	7727	88.2
2010	7199.7	950	81.4	81.0	81.4	76.0	86.5	75.6	7168	81.8

2011	7625.2	950	86.4	81.3	86.4	76.6	91.6	76.5	7619	87.0
2012	8517.8	950	97.7	82.2	97.7	77.7	102.1	77.8	8608	98.0
2013	7847.3	950	89.1	82.5	89.1	78.2	94.3	78.6	7847	89.6
2014	7204.5	950	81.4	82.5	81.3	78.4	86.6	79.0	7173	81.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1994 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					32	
C. Inspection, maintenance or repair combined with refuelling	1588			1162		
D. Inspection, maintenance or repair without refuelling				21		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						16
L. Human factor related					0	
Z. Other						79
Subtotal	1588	0	0	1183	32	95
Total		1588			1310	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1994 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		1
15. Reactor Cooling Systems		1
16. Steam generation systems		9
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		12
35. All other I&C Systems		1
41. Main Generator Systems		2
42. Electrical Power Supply Systems		1
Total	0	28

## RU-21 BELOYARSK-3

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** FBR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 560.0 MW(e)  
**Design Net Capacity:** 560.0 MW(e)  
**Design Discharge Burnup:** 100000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 4222.9 GW(e)·h  
**Energy Availability Factor:** 83.8%  
**Load Factor:** 86.1%  
**Operating Factor:** 85.1%  
**Energy Unavailability Factor:** 16.2%  
**Total Off-line Time:** 1306 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	415.4	385.4	429.8	246.5	0.0	416.6	418.8	430.0	417.5	224.2	409.9	428.9	4222.9
<b>EAF (%)</b>	97.3	100.0	100.0	60.7	1.2	99.7	97.0	100.0	100.0	53.6	98.0	100.0	83.8
<b>UCF (%)</b>	97.3	100.0	100.0	60.7	1.2	99.7	97.0	100.0	100.0	53.6	98.0	100.0	83.8
<b>LF (%)</b>	99.7	102.4	103.2	61.1	0.0	103.3	100.5	103.2	103.5	53.7	101.7	102.9	86.1
<b>OF (%)</b>	100.0	100.0	100.0	62.1	2.7	100.0	100.0	100.0	100.0	58.5	100.0	100.0	85.1
<b>EUf (%)</b>	2.7	0.0	0.0	39.3	98.8	0.3	3.0	0.0	0.0	46.4	2.0	0.0	16.2
<b>PUf (%)</b>	0.0	0.0	0.0	39.3	98.8	0.3	0.0	0.0	0.0	46.4	2.0	0.0	15.7
<b>UCLF (%)</b>	2.7	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - APRIL, JUNE - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 112513 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.04.19 TO 2014.06.01. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1969  
**Date of First Criticality:** 26 Feb 1980  
**Date of Grid Connection:** 08 Apr 1980  
**Date of Commercial Operation:** 01 Nov 1981

**Lifetime Generation:** 124116.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 74.6%  
**Cumulative Load Factor:** 74.6%  
**Cumulative Unit Capability Factor:** 75.2%  
**Cumulative Energy Unavailability Factor:** 25.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981			Data not provided							
1982	2771.0	560	59.3	59.3	59.3	59.3	56.5	56.5	5555	63.4
1983	3545.2	560	73.4	66.3	72.7	66.0	72.3	64.4	6737	76.9
1984	3584.1	560	73.3	68.6	73.3	68.4	72.9	67.2	6848	78.0
1985	3561.8	560	72.9	69.7	72.9	69.5	72.6	68.6	6544	74.7
1986	3600.7	560	74.3	70.6	73.8	70.4	73.4	69.5	6818	77.8
1987	3895.0	600	75.9	71.5	75.9	71.4	74.1	70.3	6714	76.6
1988	3762.2	560	77.0	72.3	77.0	72.2	76.5	71.2	6810	77.5
1989	3694.4	560	77.0	72.9	77.0	72.8	75.3	71.7	6800	77.6
1990	3198.0	560	66.6	72.2	65.9	72.0	65.2	71.0	6627	75.7
1991	3394.0	560	63.6	71.3	63.6	71.2	69.2	70.8	6631	75.7
1992	4095.0	560	83.1	72.4	82.8	72.2	83.3	71.9	7449	84.8
1993	3914.9	560	79.6	73.0	79.5	72.8	79.8	72.6	7065	80.7
1994	3810.7	560	78.9	73.4	78.8	73.3	77.7	73.0	6977	79.6
1995	3413.3	560	72.3	73.4	70.7	73.1	69.6	72.7	6953	79.4
1996	3722.3	560	78.1	73.7	76.3	73.3	75.7	72.9	7010	79.8
1997	3545.8	560	74.6	73.7	73.0	73.3	72.3	72.9	6596	75.3
1998	2335.3	560	49.2	72.3	47.7	71.8	47.6	71.4	4385	50.1

1999	3721.0	560	78.0	72.6	76.2	72.0	75.9	71.7	6972	79.6
2000	3565.8	560	75.5	72.8	72.5	72.1	72.5	71.7	6820	77.6
2001	3891.1	560	80.7	73.2	79.9	72.4	79.3	72.1	7214	82.4
2002	3774.4	560	79.3	73.5	77.3	72.7	76.9	72.3	7069	80.7
2003	3693.3	560	76.8	73.6	75.7	72.8	75.3	72.4	6836	78.0
2004	3927.6	560	80.8	73.9	80.0	73.1	79.8	72.8	7185	81.8
2005	3802.7	560	78.8	74.1	77.8	73.3	77.5	73.0	6977	79.6
2006	3844.9	560	79.0	74.3	78.4	73.5	78.4	73.2	7001	79.9
2007	3798.4	560	77.8	74.4	77.5	73.7	77.4	73.3	7089	80.9
2008	3781.0	560	76.9	74.5	76.8	73.8	76.9	73.5	6918	78.8
2009	3736.6	560	75.6	74.6	75.6	73.9	76.2	73.6	6734	76.9
2010	3669.8	560	73.6	74.5	73.5	73.8	74.8	73.6	6541	74.7
2011	3968.7	560	79.2	74.7	79.2	74.0	80.9	73.9	7141	81.5
2012	3975.5	560	78.8	74.8	78.8	74.2	80.8	74.1	7250	82.5
2013	3841.1	560	77.8	74.9	77.6	74.3	78.3	74.2	7398	84.5
2014	4222.9	560	83.8	75.2	83.8	74.6	86.1	74.6	7455	85.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					141	
C. Inspection, maintenance or repair combined with refuelling	1321			1253		
D. Inspection, maintenance or repair without refuelling				460	6	
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					1	
T. Heat supply (on-site to support next unit or desalination and off-site distribution)						0
Subtotal	1321	0	0	1713	148	2
Total	1321			1863		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		4
13. Reactor Auxiliary Systems		14
15. Reactor Cooling Systems		34
21. Fuel Handling and Storage Facilities		80
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		2
35. All other I&C Systems		4
42. Electrical Power Supply Systems		0
Total	0	138

# RU-141 BILIBINO-1

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 11.0 MW(e)  
**Design Net Capacity:** 11.0 MW(e)  
**Design Discharge Burnup:** 3000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 44.5 GW(e)·h  
**Energy Availability Factor:** 82.2%  
**Load Factor:** 46.2%  
**Operating Factor:** 80.0%  
**Energy Unavailability Factor:** 17.8%  
**Total Off-line Time:** 1753 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	4.5	0.0	0.7	3.2	4.1	2.2	2.8	4.4	5.2	5.4	6.3	5.8	44.5
<b>EAF (%)</b>	75.5	4.5	29.5	72.9	100.0	100.0	99.9	98.6	100.0	99.2	100.0	100.0	82.2
<b>UCF (%)</b>	75.5	4.6	29.5	72.9	100.0	100.0	99.9	98.6	100.0	99.2	100.0	100.0	82.2
<b>LF (%)</b>	54.6	0.0	8.9	40.3	49.7	27.3	34.8	53.4	65.1	66.0	79.3	70.8	46.2
<b>OF (%)</b>	74.3	0.0	25.7	59.9	100.0	100.0	99.7	96.4	100.0	97.4	100.0	100.0	80.0
<b>EUUF (%)</b>	24.5	95.5	70.5	27.1	0.0	0.0	0.1	1.4	0.0	0.8	0.0	0.0	17.8
<b>PUF (%)</b>	24.5	95.5	70.5	0.0	0.0	0.0	0.1	0.0	0.0	0.8	0.0	0.0	15.5
<b>UCLF (%)</b>	0.0	0.0	0.0	27.2	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	2.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE.

THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.01.14 TO 2014.03.23.

RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1970 **Lifetime Generation:** 1952.0 GW(e)·h  
**Date of First Criticality:** 11 Dec 1973 **Cumulative Energy Availability Factor:** 67.5%  
**Date of Grid Connection:** 12 Jan 1974 **Cumulative Load Factor:** 52.7%  
**Date of Commercial Operation:** 01 Apr 1974 **Cumulative Unit Capability Factor:** 77.0%  
**Cumulative Energy Unavailability Factor:** 32.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	45.3	10	88.0	88.0	88.0	88.0	68.7	68.7	5846	88.6
1975	56.5	10	80.2	83.6	74.4	80.2	64.5	66.3	7105	81.1
1976	55.5	10	90.9	86.2	83.7	81.5	63.2	65.2	7830	89.1
1977	43.7	10	81.4	85.0	70.4	78.5	49.9	61.1	6846	78.2
1978	53.8	10	91.3	86.3	91.3	81.2	61.5	61.2	7466	85.2
1979	64.8	10	81.2	85.4	76.0	80.3	74.0	63.4	7574	86.5
1980	59.4	10	81.8	84.9	74.1	79.4	67.6	64.0	8065	91.8
1981	50.7	10	82.0	84.5	72.7	78.5	57.9	63.2	7260	82.9
1982	72.3	10	85.0	84.6	85.0	79.3	82.5	65.4	7627	87.1
1983	69.9	10	88.7	85.0	83.3	79.7	79.8	66.9	7810	89.2
1984	77.9	10	88.9	85.3	88.0	80.5	88.7	68.9	7854	89.4
1985	77.7	10	91.2	85.8	88.4	81.1	88.7	70.6	8025	91.6
1986	73.2	10	86.1	85.9	83.2	81.3	83.5	71.6	7603	86.8
1987	76.7	12	81.3	85.5	81.3	81.3	73.0	71.7	7117	81.2
1988	79.6	11	90.3	85.8	90.3	82.0	82.4	72.5	7895	89.9
1989	70.9	11	90.0	86.1	90.0	82.5	73.5	72.6	7841	89.5
1990	76.6	11	85.1	86.0	85.1	82.7	79.5	73.0	7397	84.4
1991	71.6	11	78.6	85.6	78.6	82.4	74.3	73.1	6802	77.6
1992	67.1	11	85.8	85.6	85.8	82.6	69.4	72.9	7477	85.1
1993	53.2	11	86.3	85.7	62.7	81.6	55.2	72.0	7492	85.5

1994	49.6	11	86.9	85.7	86.9	81.8	51.5	70.9	7501	85.6
1995	26.6	11	41.6	83.6	41.6	79.9	27.6	68.8	3624	41.4
1996	29.6	11	54.1	82.2	54.1	78.7	30.7	67.1	4572	52.0
1997	35.2	11	56.5	81.1	56.5	77.7	36.6	65.7	4877	55.7
1998	55.5	11	96.3	81.7	67.0	77.3	57.6	65.4	8414	96.1
1999	33.4	11	54.9	80.7	40.3	75.8	34.7	64.1	4779	54.6
2000	58.8	11	87.4	80.9	68.1	75.5	60.8	64.0	7616	86.7
2001	45.9	11	72.9	80.6	55.0	74.7	47.6	63.4	6393	73.0
2002	49.6	11	84.5	80.8	60.0	74.2	51.5	63.0	7375	84.2
2003	25.8	11	55.8	79.9	34.1	72.8	26.8	61.7	4805	54.9
2004	34.6	11	85.2	80.1	46.6	71.9	35.8	60.8	7434	84.6
2005	26.2	11	79.8	80.1	38.5	70.8	27.2	59.7	6904	78.8
2006	23.9	11	84.3	80.2	36.3	69.7	24.8	58.6	7162	81.8
2007	28.4	11	85.6	80.4	40.7	68.8	29.5	57.7	7154	81.7
2008	29.5	11	72.6	80.1	72.6	68.9	30.5	56.9	6261	71.3
2009	0.0	11	0.0	77.8	0.0	67.0	0.0	55.3	0	0.0
2010	8.4	11	20.7	76.2	20.7	65.7	8.7	54.0	1481	16.9
2011	38.2	11	87.4	76.5	87.4	66.3	39.6	53.6	6363	72.6
2012	40.3	11	86.4	76.8	86.4	66.8	41.7	53.3	6559	74.7
2013	37.7	11	79.1	76.8	79.1	67.1	39.1	52.9	6326	72.2
2014	44.5	11	82.2	77.0	82.2	67.5	46.2	52.7	7007	80.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		316			76	
C. Inspection, maintenance or repair combined with refuelling	1417			1266		
D. Inspection, maintenance or repair without refuelling				323		
E. Testing of plant systems or components	20			270		
H. Nuclear regulatory requirements					22	
J. Grid limitation, failure or grid unavailability						35
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						73
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					1	
Z. Other				6	9	
Subtotal	1437	316	0	1865	108	108
Total		1753			2081	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems		0
13. Reactor Auxiliary Systems		4
14. Safety Systems		1
15. Reactor Cooling Systems		2
31. Turbine and auxiliaries		20
32. Feedwater and Main Steam System	316	8
33. Circulating Water System		4
35. All other I&C Systems		2
41. Main Generator Systems		13
42. Electrical Power Supply Systems		1
Total	316	71

## RU-142 BILIBINO-2

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 11.0 MW(e)  
**Design Net Capacity:** 11.0 MW(e)  
**Design Discharge Burnup:** 3000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 41.0 GW(e)·h  
**Energy Availability Factor:** 84.9%  
**Load Factor:** 42.5%  
**Operating Factor:** 73.7%  
**Energy Unavailability Factor:** 15.1%  
**Total Off-line Time:** 2303 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	4.2	5.3	6.5	0.4	0.0	0.0	1.7	4.0	4.3	5.0	4.5	5.1	41.0
<b>EAF (%)</b>	98.7	100.0	100.0	14.3	6.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	84.9
<b>UCF (%)</b>	98.7	100.0	100.0	14.3	6.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	84.9
<b>LF (%)</b>	51.7	71.2	79.4	5.0	0.0	0.0	21.1	49.2	53.8	60.6	56.3	62.9	42.5
<b>OF (%)</b>	97.4	100.0	100.0	10.1	2.3	10.1	64.8	100.0	100.0	100.0	99.9	100.0	73.7
<b>EUf (%)</b>	1.3	0.0	0.0	85.7	93.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1
<b>PUf (%)</b>	1.3	0.0	0.0	85.7	93.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE.

THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.04.04 TO 2014.05.30.

RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES.

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1970      **Lifetime Generation:** 1982.0 GW(e)·h  
**Date of First Criticality:** 07 Dec 1974      **Cumulative Energy Availability Factor:** 71.6%  
**Date of Grid Connection:** 30 Dec 1974      **Cumulative Load Factor:** 53.3%  
**Date of Commercial Operation:** 01 Feb 1975      **Cumulative Unit Capability Factor:** 81.8%  
**Cumulative Energy Unavailability Factor:** 28.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	62.6	10	94.7	94.7	89.0	89.0	78.1	78.1	7226	90.1
1976	66.1	10	89.4	91.9	83.7	86.2	75.3	76.6	7901	89.9
1977	57.0	10	90.5	91.4	81.3	84.5	65.1	72.7	7865	89.8
1978	60.6	10	94.8	92.3	94.8	87.2	69.2	71.8	7929	90.5
1979	69.9	10	92.9	92.4	88.2	87.4	79.7	73.4	8170	93.3
1980	44.0	10	62.7	87.4	59.8	82.7	50.1	69.5	5666	64.5
1981	41.4	10	73.1	85.3	70.4	80.9	47.2	66.3	6520	74.4
1982	63.9	10	79.2	84.6	79.2	80.7	73.0	67.1	7028	80.2
1983	73.8	10	90.1	85.2	86.9	81.4	84.2	69.0	7880	90.0
1984	77.6	10	89.3	85.6	88.5	82.1	88.4	71.0	7891	89.8
1985	78.0	10	90.3	86.0	88.6	82.7	89.0	72.6	7940	90.6
1986	76.3	10	87.0	86.1	84.7	82.9	87.1	73.8	7679	87.7
1987	88.4	12	89.1	86.4	89.1	83.4	84.1	74.8	7794	89.0
1988	75.1	11	90.8	86.7	90.8	84.0	77.7	75.0	7927	90.2
1989	74.8	11	91.4	87.1	91.4	84.5	77.6	75.2	7943	90.7
1990	72.6	11	84.6	86.9	84.6	84.5	75.4	75.2	7274	83.0
1991	57.8	11	64.9	85.5	64.9	83.3	60.0	74.3	4821	55.0
1992	68.2	11	89.9	85.8	89.9	83.7	70.6	74.0	7857	89.4
1993	52.4	11	81.9	85.6	62.2	82.5	54.4	72.9	7072	80.7
1994	47.8	11	78.7	85.2	77.3	82.2	49.6	71.7	6763	77.2



1995	45.4	11	99.2	85.9	97.2	83.0	47.2	70.5	8677	99.1
1996	16.8	11	33.5	83.4	33.5	80.6	17.4	67.9	2894	32.9
1997	44.1	11	92.7	83.8	87.7	80.9	45.8	66.9	8050	91.9
1998	18.2	11	42.9	82.0	23.3	78.4	18.8	64.8	3727	42.5
1999	54.2	11	84.7	82.1	64.1	77.8	56.2	64.5	7355	84.0
2000	48.5	11	78.2	82.0	56.3	77.0	50.2	63.9	6656	75.8
2001	56.7	11	85.2	82.1	65.8	76.5	58.9	63.7	7439	84.9
2002	30.0	11	66.4	81.5	38.4	75.1	31.2	62.5	5744	65.6
2003	33.3	11	82.2	81.6	44.5	74.0	34.5	61.5	7162	81.8
2004	17.9	11	70.3	81.2	27.2	72.4	18.5	60.0	5851	66.6
2005	25.3	11	84.9	81.3	38.2	71.3	26.3	58.9	7351	83.9
2006	20.3	11	84.2	81.4	32.7	70.0	21.1	57.7	7248	82.7
2007	26.4	11	86.7	81.5	39.9	69.1	27.4	56.7	7478	85.4
2008	30.3	11	78.8	81.5	78.8	69.4	31.3	55.9	6490	73.9
2009	42.4	11	86.1	81.6	86.1	69.9	44.0	55.6	7388	84.3
2010	48.1	11	88.1	81.8	88.1	70.4	49.9	55.4	7627	87.1
2011	21.7	11	84.4	81.9	84.4	70.8	22.5	54.5	4977	56.8
2012	28.3	11	72.7	81.6	72.7	70.8	29.3	53.8	5461	62.2
2013	43.1	11	85.8	81.7	85.8	71.2	44.8	53.6	6904	78.8
2014	41.0	11	84.9	81.8	84.9	71.6	42.5	53.3	6457	73.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					119	
C. Inspection, maintenance or repair combined with refuelling	1374			1335	74	
D. Inspection, maintenance or repair without refuelling				119		
E. Testing of plant systems or components	19			6		
J. Grid limitation, failure or grid unavailability						14
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			909			102
L. Human factor related					4	
Z. Other				5		
Subtotal	1393	0	909	1465	197	116
Total	2302			1778		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		63
12. Reactor I&C Systems		9
14. Safety Systems		0
15. Reactor Cooling Systems		6
16. Steam generation systems		3
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		7
33. Circulating Water System		0
41. Main Generator Systems		6
XX. Miscellaneous Systems		3
Total	0	115

# RU-143 BILIBINO-3

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 11.0 MW(e)  
**Design Net Capacity:** 11.0 MW(e)  
**Design Discharge Burnup:** 3000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 45.1 GW(e)·h  
**Energy Availability Factor:** 76.7%  
**Load Factor:** 46.8%  
**Operating Factor:** 75.5%  
**Energy Unavailability Factor:** 23.3%  
**Total Off-line Time:** 2145 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	6.6	5.5	6.2	6.5	4.7	2.6	3.7	5.2	2.7	0.0	0.0	1.4	45.1
<b>EAF (%)</b>	100.0	100.0	99.6	100.0	100.0	100.0	99.9	100.0	62.1	4.5	4.5	50.4	76.7
<b>UCF (%)</b>	100.0	100.0	99.6	100.0	100.0	100.0	99.9	100.0	62.1	4.6	4.6	50.4	76.7
<b>LF (%)</b>	80.2	74.5	75.5	82.0	57.8	32.3	44.9	63.6	34.7	0.0	0.0	17.6	46.8
<b>OF (%)</b>	100.0	100.0	99.2	100.0	100.0	100.0	99.7	100.0	60.3	0.0	0.0	48.0	75.5
<b>EUUF (%)</b>	0.0	0.0	0.4	0.0	0.0	0.0	0.1	0.0	37.9	95.5	95.5	49.6	23.3
<b>PUF (%)</b>	0.0	0.0	0.4	0.0	0.0	0.0	0.1	0.0	37.9	95.5	95.5	49.6	23.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE.  
 THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 2014.09.14 TO 2014.12.17. RADIONUCLIDES CONTENT IN  
 THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE  
 BACKGROUND VALUES.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1970 **Lifetime Generation:** 1992.0 GW(e)·h  
**Date of First Criticality:** 06 Dec 1975 **Cumulative Energy Availability Factor:** 71.2%  
**Date of Grid Connection:** 22 Dec 1975 **Cumulative Load Factor:** 54.9%  
**Date of Commercial Operation:** 01 Feb 1976 **Cumulative Unit Capability Factor:** 81.6%  
**Cumulative Energy Unavailability Factor:** 28.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1976	50.0	10	90.5	90.5	83.3	83.3	62.2	62.2	6222	77.4
1977	46.5	10	92.8	91.7	78.2	80.7	53.1	57.4	7533	86.0
1978	61.9	10	86.2	89.9	86.2	82.6	70.6	62.0	7514	85.8
1979	62.1	10	88.9	89.6	82.5	82.5	70.9	64.2	7837	89.5
1980	79.4	10	92.2	90.1	91.0	84.3	90.4	69.6	8130	92.6
1981	89.8	10	96.6	91.2	96.6	86.4	102.5	75.1	8480	96.8
1982	79.3	10	94.8	91.8	94.8	87.6	90.6	77.4	8323	95.0
1983	72.8	10	88.8	91.4	85.3	87.3	83.1	78.1	7782	88.8
1984	76.5	10	89.1	91.1	87.4	87.3	87.1	79.1	7876	89.7
1985	69.8	10	80.3	90.1	78.5	86.4	79.7	79.2	7119	81.3
1986	77.1	10	91.0	90.1	87.7	86.5	88.0	80.0	8001	91.3
1987	89.1	12	89.1	90.0	89.1	86.8	84.7	80.4	7801	89.1
1988	76.7	11	89.5	90.0	89.5	87.0	79.4	80.4	7815	89.0
1989	74.3	11	89.5	89.9	89.1	87.2	77.1	80.1	7756	88.5
1990	73.7	11	92.0	90.1	91.1	87.4	76.5	79.9	8024	91.6
1991	66.2	11	78.1	89.3	76.6	86.7	68.7	79.1	6749	77.0
1992	70.9	11	79.7	88.7	79.7	86.3	73.4	78.8	7727	88.0
1993	52.6	11	83.2	88.4	61.5	84.8	54.6	77.3	7218	82.4
1994	44.7	11	73.7	87.6	72.0	84.1	46.4	75.6	6342	72.4
1995	17.3	11	38.2	85.0	34.9	81.5	17.9	72.6	3293	37.6

1996	52.6	11	82.3	84.8	82.3	81.6	54.5	71.7	7142	81.3
1997	25.8	11	42.9	82.8	42.9	79.7	26.8	69.5	3769	43.0
1998	23.2	11	49.1	81.3	29.1	77.4	24.0	67.5	4200	47.9
1999	51.4	11	75.9	81.1	59.9	76.7	53.4	66.9	6607	75.4
2000	45.2	11	86.8	81.3	54.8	75.8	46.8	66.0	7569	86.2
2001	53.9	11	84.9	81.4	63.0	75.2	56.0	65.6	7383	84.3
2002	30.7	11	71.5	81.1	39.4	73.9	31.9	64.3	6250	71.3
2003	35.4	11	81.5	81.1	46.7	72.9	36.8	63.3	7097	81.0
2004	31.1	11	85.8	81.2	42.0	71.8	32.2	62.2	7166	81.6
2005	20.4	11	71.1	80.9	30.9	70.4	21.1	60.8	6102	69.7
2006	26.3	11	76.7	80.8	36.9	69.2	27.2	59.7	6542	74.7
2007	27.5	11	85.7	80.9	38.6	68.3	28.5	58.7	7257	82.8
2008	33.3	11	85.7	81.1	85.7	68.8	34.4	57.9	7335	83.5
2009	44.6	11	91.4	81.4	91.4	69.5	46.2	57.6	7972	91.0
2010	33.7	11	77.5	81.3	77.5	69.7	35.0	56.9	6035	68.9
2011	22.2	11	88.0	81.5	88.0	70.2	23.0	55.9	4885	55.8
2012	34.6	11	86.7	81.6	86.7	70.7	35.8	55.4	7253	82.6
2013	43.9	11	85.6	81.7	85.6	71.1	45.5	55.1	7436	84.9
2014	45.1	11	76.7	81.6	76.7	71.2	46.8	54.9	6615	75.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1976 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					52	
C. Inspection, maintenance or repair combined with refuelling	2137			1233		
D. Inspection, maintenance or repair without refuelling				291		
E. Testing of plant systems or components				6		
J. Grid limitation, failure or grid unavailability						39
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						111
Z. Other				12	1	
Subtotal	2137	0	0	1542	53	150
Total	2137			1745		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1976 to 2014 Average Hours Lost Per Year
13. Reactor Auxiliary Systems		1
15. Reactor Cooling Systems		14
31. Turbine and auxiliaries		12
32. Feedwater and Main Steam System		8
33. Circulating Water System		0
XX. Miscellaneous Systems		15
Total	0	50

# RU-144 BILIBINO-4

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 11.0 MW(e)  
**Design Net Capacity:** 11.0 MW(e)  
**Design Discharge Burnup:** 3000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 45.9 GW(e)·h  
**Energy Availability Factor:** 84.6%  
**Load Factor:** 47.6%  
**Operating Factor:** 82.0%  
**Energy Unavailability Factor:** 15.4%  
**Total Off-line Time:** 1573 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	4.0	4.0	4.7	4.9	3.6	2.8	0.8	0.0	2.7	6.5	5.8	6.2	45.9
<b>EAF (%)</b>	100.0	100.0	100.0	98.8	100.0	100.0	56.9	4.5	56.6	100.0	100.0	100.0	84.6
<b>UCF (%)</b>	100.0	100.0	100.0	98.8	100.0	100.0	56.9	4.6	56.6	100.0	100.0	100.0	84.6
<b>LF (%)</b>	48.4	54.7	57.3	62.0	43.8	34.9	9.6	0.0	33.8	78.9	73.0	76.3	47.6
<b>OF (%)</b>	100.0	100.0	100.0	96.9	100.0	100.0	35.5	0.0	54.6	100.0	100.0	100.0	82.0
<b>EUf (%)</b>	0.0	0.0	0.0	1.2	0.0	0.0	43.1	95.5	43.4	0.0	0.0	0.0	15.4
<b>PUf (%)</b>	0.0	0.0	0.0	1.2	0.0	0.0	43.1	95.5	43.4	0.0	0.0	0.0	15.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE.

THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.07.18 TO 2014.09.14.

RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1970 **Lifetime Generation:** 1858.0 GW(e)·h  
**Date of First Criticality:** 12 Dec 1976 **Cumulative Energy Availability Factor:** 70.0%  
**Date of Grid Connection:** 27 Dec 1976 **Cumulative Load Factor:** 53.6%  
**Date of Commercial Operation:** 01 Jan 1977 **Cumulative Unit Capability Factor:** 79.9%  
**Cumulative Energy Unavailability Factor:** 30.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	52.6	10	93.6	93.6	82.9	82.9	60.1	60.1	7392	84.4
1978	58.3	10	91.1	92.3	91.1	87.0	66.6	63.3	7827	89.3
1979	74.5	10	85.5	90.0	83.9	85.9	85.0	70.5	7552	86.2
1980	77.6	10	94.8	91.2	92.9	87.7	88.4	75.0	8347	95.0
1981	78.3	10	87.7	90.5	86.6	87.5	89.3	77.9	7734	88.3
1982	77.6	10	90.7	90.6	90.7	88.0	88.6	79.7	7976	91.1
1983	75.5	10	90.0	90.5	86.9	87.9	86.2	80.6	7923	90.4
1984	79.0	10	87.6	90.1	86.8	87.7	89.9	81.8	7744	88.2
1985	81.2	10	90.3	90.1	89.5	87.9	92.7	83.0	7919	90.4
1986	74.5	10	79.9	89.1	79.8	87.1	85.1	83.2	7083	80.9
1987	95.5	12	93.3	89.6	93.3	87.8	90.9	84.0	8154	93.1
1988	75.8	11	87.3	89.4	87.3	87.7	78.5	83.5	7617	86.7
1989	71.4	11	93.2	89.7	93.2	88.2	74.1	82.7	7853	89.6
1990	75.3	11	87.2	89.5	86.4	88.0	78.1	82.4	7588	86.6
1991	61.3	11	71.4	88.2	69.9	86.8	63.6	81.1	6139	70.1
1992	69.8	11	87.8	88.2	87.8	86.8	72.3	80.5	7756	88.3
1993	56.0	11	80.2	87.7	64.4	85.4	58.1	79.1	6918	79.0
1994	38.5	11	62.0	86.2	61.8	84.1	39.9	76.8	5266	60.1
1995	29.9	11	63.9	85.0	62.7	82.9	31.0	74.3	5083	58.0
1996	35.2	11	59.1	83.6	59.1	81.7	36.4	72.3	5109	58.2

1997	15.1	11	37.0	81.3	28.4	79.0	15.7	69.5	2490	28.4
1998	37.3	11	63.1	80.5	44.5	77.4	38.7	68.1	5510	62.9
1999	28.7	11	46.7	78.9	34.8	75.5	29.8	66.4	3993	45.6
2000	55.8	11	88.7	79.4	64.2	75.0	57.8	66.0	7740	88.1
2001	35.4	11	68.0	78.9	43.2	73.7	36.8	64.8	5931	67.7
2002	33.1	11	73.8	78.7	46.3	72.6	34.4	63.6	6419	73.3
2003	24.5	11	67.5	78.3	34.0	71.1	25.4	62.1	5849	66.8
2004	26.1	11	83.9	78.5	36.7	69.8	27.0	60.8	7303	83.1
2005	24.9	11	84.3	78.7	36.3	68.7	25.9	59.6	7300	83.3
2006	25.2	11	76.9	78.6	36.4	67.6	26.2	58.4	6626	75.6
2007	19.6	11	76.5	78.5	30.9	66.3	20.3	57.2	5983	68.3
2008	29.6	11	87.7	78.8	87.7	67.0	30.6	56.3	7023	80.0
2009	42.1	11	88.4	79.1	88.4	67.7	43.7	55.9	7663	87.5
2010	37.5	11	86.9	79.4	86.9	68.3	38.9	55.4	7272	83.0
2011	32.8	11	77.3	79.3	77.3	68.5	34.0	54.8	5944	67.9
2012	24.5	11	86.7	79.5	86.7	69.0	25.4	54.0	5886	67.0
2013	45.5	11	87.4	79.7	87.4	69.6	47.2	53.8	7472	85.3
2014	45.9	11	84.6	79.9	84.6	70.0	47.6	53.6	7187	82.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					51	
C. Inspection, maintenance or repair combined with refuelling	1407			1380		
D. Inspection, maintenance or repair without refuelling				364		
E. Testing of plant systems or components	22			7		
J. Grid limitation, failure or grid unavailability						51
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			143			115
L. Human factor related					0	
Z. Other					1	
Subtotal	1429	0	143	1751	52	166
Total		1572			1969	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		11
13. Reactor Auxiliary Systems		6
15. Reactor Cooling Systems		1
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		6
33. Circulating Water System		4
41. Main Generator Systems		15
Total	0	47

# RU-30 KALININ-1

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 5892.1 GW(e)·h  
**Energy Availability Factor:** 67.5%  
**Load Factor:** 70.8%  
**Operating Factor:** 68.9%  
**Energy Unavailability Factor:** 32.5%  
**Total Off-line Time:** 2726 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	244.8	0.0	0.0	1.1	581.8	724.5	744.5	736.2	640.4	763.7	694.7	760.4	5892.1
<b>EAF (%)</b>	32.6	0.0	0.0	4.3	83.7	99.0	100.0	100.0	89.0	100.0	95.5	100.0	67.5
<b>UCF (%)</b>	32.6	0.0	0.0	4.3	83.7	99.0	100.0	100.0	89.1	100.0	95.5	100.0	67.5
<b>LF (%)</b>	34.6	0.0	0.0	0.2	82.3	105.9	105.3	104.2	93.6	107.9	101.6	107.6	70.8
<b>OF (%)</b>	32.9	0.0	0.0	5.4	96.1	100.0	100.0	100.0	89.6	100.0	96.4	100.0	68.9
<b>EUUF (%)</b>	67.4	100.0	100.0	95.7	16.3	1.0	0.0	0.0	11.0	0.0	4.5	0.0	32.5
<b>PUF (%)</b>	67.4	100.0	100.0	95.7	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	29.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	16.3	0.0	0.0	0.0	11.0	0.0	4.5	0.0	2.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY, MAY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 335310 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 2014.01.11 TO 2014.04.29. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1977  
**Date of First Criticality:** 10 Apr 1984  
**Date of Grid Connection:** 09 May 1984  
**Date of Commercial Operation:** 12 Jun 1985

**Lifetime Generation:** 186702.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 73.5%  
**Cumulative Load Factor:** 74.6%  
**Cumulative Unit Capability Factor:** 74.3%  
**Cumulative Energy Unavailability Factor:** 26.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	2799.6	950	58.3	58.3	58.3	58.3	57.4	57.4	3101	60.4
1986	5297.7	950	62.8	61.2	62.8	61.2	63.7	61.3	5946	67.9
1987	6842.5	1000	78.7	68.2	78.7	68.2	78.1	68.0	6972	79.6
1988	5891.6	950	70.1	68.7	70.1	68.7	70.6	68.7	6187	70.4
1989	6129.7	950	71.9	69.4	71.9	69.4	73.7	69.8	6396	73.0
1990	5192.3	950	61.6	68.0	61.5	68.0	62.4	68.5	5435	62.0
1991	6482.7	950	78.1	69.5	77.1	69.4	77.9	69.9	7161	81.7
1992	6781.4	950	80.4	70.9	80.3	70.8	81.3	71.4	7388	84.1
1993	4927.2	950	66.6	70.4	59.4	69.5	59.2	70.0	6133	70.0
1994	4437.6	950	54.4	68.8	54.1	67.9	53.3	68.3	5440	62.1
1995	4699.0	950	57.0	67.7	56.8	66.8	56.5	67.1	6265	71.5
1996	4431.7	950	53.3	66.4	53.2	65.7	53.1	65.9	5628	64.1
1997	5197.1	950	65.0	66.3	63.2	65.5	62.4	65.7	6195	70.7
1998	6101.0	950	73.3	66.8	73.0	66.0	73.3	66.2	6937	79.2
1999	5775.1	950	73.1	67.3	69.3	66.3	69.4	66.4	6589	75.2
2000	6289.7	950	76.8	67.9	75.0	66.8	75.4	67.0	6784	77.2
2001	6627.5	950	79.4	68.6	78.2	67.5	79.6	67.8	7020	80.1
2002	7248.4	950	86.1	69.6	84.7	68.5	87.1	68.9	7568	86.4

2003	7155.9	950	83.7	70.3	83.1	69.3	86.0	69.8	7408	84.6
2004	6937.0	950	81.5	70.9	80.7	69.8	83.1	70.5	7179	81.7
2005	6836.3	950	81.5	71.4	80.4	70.3	82.1	71.0	7219	82.4
2006	6743.6	950	80.6	71.8	79.5	70.8	81.0	71.5	7112	81.2
2007	7150.4	950	85.2	72.4	84.0	71.4	85.9	72.1	7491	85.5
2008	6953.5	950	81.5	72.8	81.5	71.8	83.3	72.6	7209	82.1
2009	7234.7	950	87.3	73.4	87.3	72.4	86.9	73.2	7669	87.5
2010	7006.1	950	82.7	73.8	82.6	72.8	84.2	73.6	7175	81.9
2011	7516.9	950	87.9	74.3	87.9	73.4	90.3	74.2	7727	88.2
2012	6648.3	950	77.5	74.4	77.5	73.5	79.7	74.4	6833	77.8
2013	6964.0	950	78.7	74.6	78.7	73.7	83.7	74.8	6915	78.9
2014	5892.1	950	67.5	74.3	67.5	73.5	70.8	74.6	6035	68.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		129			282	
C. Inspection, maintenance or repair combined with refuelling	2597			1440	36	
D. Inspection, maintenance or repair without refuelling				101	1	
E. Testing of plant systems or components					1	
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					5	
Z. Other					42	
Subtotal	2597	129	0	1541	367	3
Total		2726			1911	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		21
12. Reactor I&C Systems	104	10
15. Reactor Cooling Systems		2
16. Steam generation systems		34
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		24
35. All other I&C Systems		6
41. Main Generator Systems	25	136
42. Electrical Power Supply Systems		7
XX. Miscellaneous Systems		3
Total	129	278

## RU-31 KALININ-2

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7030.4 GW(e)·h  
**Energy Availability Factor:** 79.6%  
**Load Factor:** 84.5%  
**Operating Factor:** 79.7%  
**Energy Unavailability Factor:** 20.4%  
**Total Off-line Time:** 1777 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	738.3	688.1	760.8	610.2	0.0	0.0	506.7	731.8	736.6	765.5	737.5	754.7	7030.4
<b>EAF (%)</b>	100.0	100.0	100.0	83.8	0.0	0.0	72.1	100.0	100.0	100.0	100.0	100.0	79.6
<b>UCF (%)</b>	100.0	100.0	100.0	83.8	0.0	0.0	72.1	100.0	100.0	100.0	100.0	100.0	79.6
<b>LF (%)</b>	104.5	107.8	107.6	89.2	0.0	0.0	71.7	103.5	107.7	108.2	107.8	106.8	84.5
<b>OF (%)</b>	100.0	100.0	100.0	84.2	0.0	0.0	73.3	100.0	100.0	100.0	100.0	100.0	79.7
<b>EUf (%)</b>	0.0	0.0	0.0	16.2	100.0	100.0	27.9	0.0	0.0	0.0	0.0	0.0	20.4
<b>PUf (%)</b>	0.0	0.0	0.0	16.2	100.0	100.0	27.9	0.0	0.0	0.0	0.0	0.0	20.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - APRIL, JULY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 412112 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.04.26 TO 2014.07.09. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1982  
**Date of First Criticality:** 25 Nov 1986  
**Date of Grid Connection:** 03 Dec 1986  
**Date of Commercial Operation:** 03 Mar 1987

**Lifetime Generation:** 179152.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 75.1%  
**Cumulative Load Factor:** 77.0%  
**Cumulative Unit Capability Factor:** 77.4%  
**Cumulative Energy Unavailability Factor:** 24.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	5815.1	1000	86.3	86.3	86.3	86.3	79.2	79.2	6460	88.0
1988	5829.4	950	71.7	78.5	71.7	78.5	69.9	74.2	6446	73.4
1989	6580.5	950	78.5	78.5	78.5	78.5	79.1	75.9	7034	80.3
1990	6788.2	950	79.5	78.7	79.5	78.7	81.6	77.4	7083	80.9
1991	4729.7	950	49.8	72.8	49.8	72.8	56.8	73.2	5154	58.8
1992	5496.3	950	65.7	71.6	65.7	71.6	65.9	71.9	6145	70.0
1993	5862.3	950	56.5	69.4	51.9	68.7	70.4	71.7	7078	80.8
1994	4463.8	950	54.9	67.6	54.9	67.0	53.6	69.4	6989	79.8
1995	5769.7	950	72.4	68.1	69.5	67.3	69.3	69.4	7283	83.1
1996	4595.2	950	78.4	69.1	56.0	66.1	55.1	68.0	7501	85.4
1997	3880.6	950	62.7	68.6	47.3	64.4	46.6	66.0	6117	69.8
1998	4946.7	950	60.0	67.8	59.7	64.0	59.4	65.4	6839	78.1
1999	6379.3	950	80.0	68.8	76.2	64.9	76.7	66.3	7155	81.7
2000	6418.7	950	83.6	69.8	76.3	65.8	76.9	67.1	7441	84.7
2001	6709.0	950	80.0	70.5	79.2	66.7	80.6	68.0	7070	80.7
2002	7003.4	950	85.8	71.5	82.7	67.7	84.2	69.0	7554	86.2
2003	7329.5	950	85.9	72.3	85.3	68.7	88.1	70.1	7541	86.1
2004	7398.2	950	87.1	73.2	86.7	69.7	88.7	71.2	7674	87.4



2005	6116.3	950	73.6	73.2	72.1	69.8	73.5	71.3	6476	73.9
2006	7074.9	950	84.3	73.7	82.7	70.5	85.0	72.0	7400	84.5
2007	7231.4	950	85.5	74.3	84.2	71.1	86.9	72.7	7539	86.1
2008	7474.8	950	88.2	74.9	88.2	71.9	89.6	73.5	7756	88.3
2009	7004.2	950	82.5	75.3	82.5	72.4	84.2	73.9	7248	82.7
2010	7423.5	950	87.8	75.8	87.8	73.0	89.2	74.6	7595	86.7
2011	7570.6	950	87.0	76.2	87.0	73.6	91.0	75.2	7675	87.6
2012	7164.9	950	84.5	76.6	84.5	74.0	85.9	75.6	7464	85.0
2013	8635.1	950	97.6	77.3	97.6	74.9	103.8	76.7	8552	97.6
2014	7030.4	950	79.6	77.4	79.6	75.1	84.5	77.0	6984	79.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					178	
C. Inspection, maintenance or repair combined with refuelling	1777			1234	7	
D. Inspection, maintenance or repair without refuelling				82		
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					13	
Z. Other					3	
Subtotal	1777	0	0	1316	201	3
Total		1777			1520	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		21
15. Reactor Cooling Systems		30
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		34
32. Feedwater and Main Steam System		7
35. All other I&C Systems		7
41. Main Generator Systems		54
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		9
Total	0	174

## RU-36 KALININ-3

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6599.5 GW(e)·h  
**Energy Availability Factor:** 78.3%  
**Load Factor:** 79.3%  
**Operating Factor:** 79.0%  
**Energy Unavailability Factor:** 21.7%  
**Total Off-line Time:** 1843 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	690.7	664.4	738.1	710.2	733.1	704.4	465.5	701.5	353.1	536.1	0.0	302.3	6599.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	65.9	98.0	53.5	76.3	0.0	45.8	78.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	65.9	98.0	53.5	76.3	0.0	45.8	78.3
<b>LF (%)</b>	97.7	104.1	104.4	103.8	103.7	103.0	65.9	99.3	51.6	75.8	0.0	42.8	79.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	68.8	100.0	54.0	78.0	0.0	46.8	79.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	34.1	2.0	46.5	23.7	100.0	54.2	21.7
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	19.7	0.0	0.0	22.4	100.0	54.2	16.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	14.4	2.0	46.5	1.3	0.0	0.0	5.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - SEPTEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 186796 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 2014.10.25 TO 2014.12.17. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1985  
**Date of First Criticality:** 25 Nov 2004  
**Date of Grid Connection:** 16 Dec 2004  
**Date of Commercial Operation:** 08 Nov 2005

**Lifetime Generation:** 67047.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 83.3%  
**Cumulative Load Factor:** 84.0%  
**Cumulative Unit Capability Factor:** 83.4%  
**Cumulative Energy Unavailability Factor:** 16.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2005	1402.5	950	100.0	100.0	100.0	100.0	100.8	100.8	1464	100.0
2006	6287.2	950	75.2	78.7	74.9	78.5	75.5	79.2	6692	76.4
2007	7185.2	950	85.5	81.9	85.0	81.5	86.3	82.5	7505	85.7
2008	7561.7	950	87.8	83.7	87.7	83.5	90.6	85.1	7737	88.1
2009	6806.5	950	86.0	84.3	86.0	84.1	81.8	84.3	7553	86.2
2010	6902.2	950	82.4	83.9	82.1	83.7	82.9	84.0	7248	82.7
2011	7088.3	950	84.9	84.1	84.8	83.9	85.2	84.2	7427	84.8
2012	7765.1	950	91.8	85.1	91.8	85.0	93.1	85.4	8091	92.1
2013	6505.7	950	76.2	84.1	76.2	83.9	78.2	84.6	6698	76.5
2014	6599.5	950	78.3	83.4	78.3	83.3	79.3	84.0	6918	79.0

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2006 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		419			241	
C. Inspection, maintenance or repair combined with refuelling	1281			938	19	

D. Inspection, maintenance or repair without refuelling	143			15		
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					1	
Z. Other					22	
Subtotal	1424	419	0	953	283	3
Total	1843			1239		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2006 to 2014 Average Hours Lost Per Year
15. Reactor Cooling Systems		8
16. Steam generation systems		6
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		73
32. Feedwater and Main Steam System	46	14
33. Circulating Water System		1
41. Main Generator Systems	373	126
42. Electrical Power Supply Systems		8
Total	419	237

## RU-37 KALININ-4

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7249.4 GW(e)·h  
**Energy Availability Factor:** 87.2%  
**Load Factor:** 87.1%  
**Operating Factor:** 87.8%  
**Energy Unavailability Factor:** 12.8%  
**Total Off-line Time:** 1070 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	712.3	666.3	733.0	513.0	714.6	685.2	670.9	4.2	454.9	689.7	688.2	717.2	7249.4
<b>EAF (%)</b>	100.0	100.0	100.0	81.0	100.0	98.9	100.0	2.0	67.9	98.0	99.9	100.0	87.2
<b>UCF (%)</b>	100.0	100.0	100.0	81.0	100.0	98.9	100.0	2.0	67.9	98.0	99.9	100.0	87.2
<b>LF (%)</b>	100.8	104.4	103.7	75.0	101.1	100.2	94.9	0.6	66.5	97.5	100.6	101.5	87.1
<b>OF (%)</b>	100.0	100.0	100.0	81.5	100.0	100.0	100.0	3.5	69.6	100.0	100.0	100.0	87.8
<b>EUUF (%)</b>	0.0	0.0	0.0	19.0	0.0	1.1	0.0	98.0	32.1	2.0	0.1	0.0	12.8
<b>PUF (%)</b>	0.0	0.0	0.0	18.8	0.0	1.1	0.0	98.0	21.2	0.0	0.0	0.0	11.7
<b>UCLF (%)</b>	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	10.8	2.0	0.1	0.0	1.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - JULY, SEPTEMBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 179066 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.08.02 TO 2014.09.07. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1986  
**Date of First Criticality:** 08 Nov 2011  
**Date of Grid Connection:** 24 Nov 2011  
**Date of Commercial Operation:** 25 Dec 2012

**Lifetime Generation:** 18929.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 82.1%  
**Cumulative Load Factor:** 82.3%  
**Cumulative Unit Capability Factor:** 82.2%  
**Cumulative Energy Unavailability Factor:** 17.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2012	680.4	950	98.1	98.1	98.1	98.1	96.3	96.3	744	100.0
2013	6342.9	950	75.7	77.5	75.7	77.5	76.2	77.8	6662	76.1
2014	7249.4	950	87.2	82.2	87.2	82.1	87.1	82.3	7691	87.8

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2012 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					237	
C. Inspection, maintenance or repair combined with refuelling	865			462		
D. Inspection, maintenance or repair without refuelling	133					
L. Human factor related		73				
Subtotal	998	73	0	462	237	0
Total		1071			699	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2012 to 2014 Average Hours Lost Per Year
41. Main Generator Systems		237
Total	0	237

# RU-12 KOLA-1

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 411.0 MW(e)  
**Design Net Capacity:** 411.0 MW(e)  
**Design Discharge Burnup:** 28600 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 1911.7 GW(e)·h  
**Energy Availability Factor:** 85.2%  
**Load Factor:** 53.1%  
**Operating Factor:** 86.0%  
**Energy Unavailability Factor:** 14.8%  
**Total Off-line Time:** 1225 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	172.2	191.5	147.9	232.9	0.8	95.4	125.2	168.3	280.6	220.6	140.6	135.6	1911.7
<b>EAF (%)</b>	100.0	100.0	55.3	88.5	2.6	78.0	100.0	100.0	100.0	100.0	100.0	100.0	85.2
<b>UCF (%)</b>	100.0	100.0	55.3	100.0	3.4	78.0	100.0	100.0	100.0	100.0	100.0	100.0	86.2
<b>LF (%)</b>	56.3	69.3	48.4	78.7	0.3	32.2	40.9	55.0	94.8	72.0	47.5	44.4	53.1
<b>OF (%)</b>	100.0	100.0	53.2	100.0	3.4	78.1	100.0	100.0	100.0	100.0	100.0	100.0	86.0
<b>EUf (%)</b>	0.0	0.0	44.7	11.5	97.4	22.0	0.0	0.0	0.0	0.0	0.0	0.0	14.8
<b>PUf (%)</b>	0.0	0.0	44.7	0.0	96.6	22.0	0.0	0.0	0.0	0.0	0.0	0.0	13.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	11.5	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE.

THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.05.02 TO 2014.06.07.

RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

## 5. Historical Summary

**Date of Construction Start:** 01 May 1970 **Lifetime Generation:** 97279.0 GW(e)·h  
**Date of First Criticality:** 26 Jun 1973 **Cumulative Energy Availability Factor:** 72.0%  
**Date of Grid Connection:** 29 Jun 1973 **Cumulative Load Factor:** 65.3%  
**Date of Commercial Operation:** 28 Dec 1973 **Cumulative Unit Capability Factor:** 77.9%  
**Cumulative Energy Unavailability Factor:** 28.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	232.3	411	100.0	100.0	100.0	100.0	76.0	76.0	744	100.0
1974	1990.1	411	79.2	80.9	79.2	80.8	55.3	56.9	8463	96.6
1975	1015.8	411	50.9	66.5	50.9	66.5	28.2	43.1	5426	61.9
1976	2421.7	411	74.2	69.0	74.1	68.9	67.1	50.9	8247	93.9
1977	2101.1	411	76.4	70.8	76.4	70.8	58.4	52.7	7462	85.2
1978	2978.8	411	82.6	73.1	82.6	73.1	82.7	58.6	8074	92.2
1979	2435.6	411	64.6	71.7	64.6	71.7	67.6	60.1	6232	71.1
1980	3466.4	411	91.1	74.5	90.9	74.4	96.0	65.2	8072	91.9
1981	2870.8	411	81.0	75.3	80.9	75.2	79.7	67.0	7448	85.0
1982	2848.1	411	85.5	76.4	85.5	76.4	79.1	68.3	7875	89.9
1983	3217.4	411	88.3	77.6	88.2	77.5	89.4	70.4	7884	90.0
1984	3112.0	411	84.9	78.2	84.9	78.2	86.2	71.8	8060	91.8
1985	2388.8	411	67.0	77.3	67.0	77.3	66.3	71.4	6001	68.5
1986	2805.8	411	85.1	77.9	85.1	77.9	77.9	71.9	8074	92.2
1987	3268.2	440	86.0	78.5	86.0	78.5	84.8	72.9	7972	91.0
1988	2925.0	411	82.7	78.8	82.7	78.8	81.0	73.4	7482	85.2
1989	2675.5	411	76.2	78.6	75.4	78.6	74.3	73.5	6731	76.8
1990	2735.5	411	76.0	78.5	76.0	78.4	76.0	73.6	6838	78.1
1991	2773.1	411	77.3	78.4	77.3	78.3	77.0	73.8	6965	79.5

1992	2271.4	411	63.7	77.6	63.4	77.6	62.9	73.2	6651	75.7
1993	1992.6	411	59.6	76.7	56.1	76.5	55.3	72.3	5663	64.6
1994	1971.6	411	58.6	75.9	56.5	75.6	54.8	71.5	5359	61.2
1995	1581.4	411	62.2	75.3	62.2	75.0	43.9	70.3	5398	61.6
1996	1410.0	411	47.4	74.1	46.4	73.7	39.1	68.9	4466	50.8
1997	2404.1	411	88.5	74.7	88.5	74.3	66.8	68.8	7942	90.7
1998	1291.7	411	59.3	74.1	37.7	72.9	35.9	67.5	5658	64.6
1999	2028.5	411	86.6	74.5	58.0	72.3	56.3	67.1	7355	84.0
2000	1298.8	411	84.1	74.9	37.2	71.0	36.0	65.9	4643	52.9
2001	2243.2	411	81.6	75.1	63.3	70.7	62.3	65.8	7098	81.0
2002	1841.5	411	68.9	74.9	51.7	70.1	51.1	65.3	5660	64.6
2003	2164.0	411	75.5	74.9	60.4	69.8	60.1	65.1	6444	73.6
2004	2440.5	411	83.6	75.2	68.2	69.7	67.6	65.2	7326	83.4
2005	2151.7	411	90.6	75.7	60.6	69.4	59.8	65.0	6901	78.8
2006	2338.7	411	89.9	76.1	66.0	69.3	65.0	65.0	7661	87.5
2007	2658.0	411	91.0	76.6	74.4	69.5	73.8	65.3	7740	88.4
2008	2705.8	411	84.3	76.8	84.3	69.9	74.9	65.6	7397	84.2
2009	2277.4	411	83.8	77.0	83.8	70.3	63.3	65.5	7333	83.7
2010	2468.0	411	85.8	77.2	85.8	70.7	68.5	65.6	7912	90.3
2011	2465.3	411	83.6	77.4	83.5	71.0	68.5	65.7	7870	89.9
2012	2205.7	411	82.2	77.5	82.2	71.3	61.1	65.5	7021	79.9
2013	2380.9	411	84.0	77.7	84.0	71.6	66.1	65.6	7811	89.2
2014	1911.7	411	86.2	77.9	85.2	72.0	53.1	65.3	7536	86.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					53	
C. Inspection, maintenance or repair combined with refuelling	878			1290	3	
D. Inspection, maintenance or repair without refuelling	333			154		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				63		
J. Grid limitation, failure or grid unavailability			15			45
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						112
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						5
Z. Other					9	
Subtotal	1211	0	15	1507	65	164
Total	1226			1736		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems		14
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		7
35. All other I&C Systems		1
41. Main Generator Systems		0
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		15

Total	0	51
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## RU-13 KOLA-2

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 411.0 MW(e)  
**Design Net Capacity:** 411.0 MW(e)  
**Design Discharge Burnup:** 28600 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 2596.5 GW(e)·h  
**Energy Availability Factor:** 89.3%  
**Load Factor:** 72.1%  
**Operating Factor:** 89.3%  
**Energy Unavailability Factor:** 10.7%  
**Total Off-line Time:** 938 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	295.5	257.9	310.3	296.2	260.2	255.0	251.7	146.0	32.9	61.0	141.5	288.3	2596.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.0	32.7	45.7	99.7	100.0	89.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	36.7	45.7	99.7	100.0	90.1
<b>LF (%)</b>	96.6	93.4	101.5	100.1	85.1	86.2	82.3	47.7	11.1	19.9	47.8	94.3	72.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	26.1	46.2	99.3	100.0	89.3
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	67.3	54.3	0.3	0.0	10.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.3	54.3	0.0	0.0	9.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	3.9	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN MARCH. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 3410 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.09.12 TO 2014.10.17. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 May 1970  
**Date of First Criticality:** 30 Nov 1974  
**Date of Grid Connection:** 09 Dec 1974  
**Date of Commercial Operation:** 21 Feb 1975

**Lifetime Generation:** 95551.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 72.7%  
**Cumulative Load Factor:** 66.4%  
**Cumulative Unit Capability Factor:** 77.9%  
**Cumulative Energy Unavailability Factor:** 27.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	1325.2	411	88.2	88.2	88.2	88.2	40.2	40.2	6040	75.3
1976	1943.1	411	70.8	79.1	70.8	79.1	53.8	47.3	7083	80.6
1977	2627.2	411	77.1	78.4	76.9	78.4	73.0	56.1	7038	80.3
1978	2982.5	411	82.7	79.5	82.7	79.5	82.8	62.9	7576	86.5
1979	3057.6	411	83.5	80.3	82.4	80.1	84.9	67.4	7663	87.5
1980	3266.9	411	86.0	81.3	85.8	81.0	90.5	71.3	7966	90.7
1981	3146.7	411	87.8	82.2	87.8	82.0	87.4	73.6	8225	93.9
1982	2463.0	411	71.2	80.8	71.2	80.7	68.4	73.0	6742	77.0
1983	3072.6	411	85.3	81.3	85.3	81.2	85.3	74.4	7963	90.9
1984	3034.5	411	86.8	81.9	86.8	81.7	84.1	75.3	8079	92.0
1985	3055.6	411	84.9	82.2	84.9	82.0	84.9	76.2	7872	89.9
1986	2844.2	411	79.8	82.0	79.7	81.8	79.0	76.5	7405	84.5
1987	3345.4	440	89.6	82.6	89.6	82.5	86.8	77.3	7900	90.2
1988	2873.3	411	80.5	82.4	80.5	82.3	79.6	77.5	7451	84.8
1989	2707.3	411	78.0	82.1	74.8	81.8	75.2	77.3	6859	78.3
1990	2610.9	411	72.9	81.6	72.7	81.3	72.5	77.0	6751	77.1
1991	2701.9	411	75.4	81.2	75.3	80.9	75.0	76.9	6983	79.7
1992	2133.0	411	61.8	80.1	61.8	79.8	59.1	75.9	5871	66.8

1993	2138.8	411	65.7	79.4	60.7	78.8	59.4	75.0	6377	72.8
1994	398.6	411	16.7	76.2	16.7	75.7	11.1	71.8	1466	16.7
1995	2205.8	411	93.6	77.1	93.6	76.6	61.3	71.3	6846	78.2
1996	1946.2	411	66.3	76.6	65.5	76.1	53.9	70.5	6243	71.1
1997	1157.9	411	53.4	75.6	40.6	74.5	32.2	68.9	3955	45.1
1998	2655.6	411	83.6	75.9	74.5	74.5	73.8	69.1	8029	91.7
1999	1272.6	411	49.0	74.8	36.3	73.0	35.3	67.7	4423	50.5
2000	2430.5	411	83.4	75.2	68.2	72.8	67.3	67.7	7626	86.8
2001	1722.3	411	84.7	75.5	49.1	71.9	47.8	67.0	6574	75.0
2002	1738.7	411	83.2	75.8	48.7	71.1	48.3	66.3	5564	63.5
2003	1866.1	411	66.4	75.5	52.0	70.4	51.8	65.8	5459	62.3
2004	1787.1	411	73.8	75.4	49.9	69.8	49.5	65.3	5731	65.2
2005	2889.2	411	84.2	75.7	78.6	70.0	80.2	65.7	7379	84.2
2006	2640.1	411	85.7	76.0	72.0	70.1	73.3	66.0	7597	86.7
2007	2508.9	411	85.7	76.3	70.1	70.1	69.7	66.1	7474	85.3
2008	2554.7	411	89.9	76.7	89.1	70.7	70.8	66.2	7762	88.4
2009	2384.6	411	80.3	76.8	79.4	70.9	66.2	66.2	6872	78.4
2010	2531.2	411	90.4	77.2	90.2	71.5	70.3	66.3	7619	87.0
2011	2502.0	411	83.6	77.4	83.1	71.8	69.5	66.4	7752	88.5
2012	2192.1	411	81.9	77.5	81.9	72.0	60.7	66.3	7775	88.5
2013	2412.7	411	82.8	77.6	82.8	72.3	67.0	66.3	7233	82.6
2014	2596.5	411	90.1	77.9	89.3	72.7	72.1	66.4	7823	89.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		5			77	
C. Inspection, maintenance or repair combined with refuelling	857			1337		
D. Inspection, maintenance or repair without refuelling				62		
E. Testing of plant systems or components	5			7		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				122		
J. Grid limitation, failure or grid unavailability			77			31
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						161
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Z. Other					0	
Subtotal	862	5	77	1528	77	194
Total		944			1799	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		45
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		2
14. Safety Systems		2
15. Reactor Cooling Systems		18
16. Steam generation systems		3
17. Safety I&C Systems (excluding reactor I&C)	5	0
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		0
35. All other I&C Systems		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems		1
Total	5	72

## RU-32 KOLA-3

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 411.0 MW(e)  
**Design Net Capacity:** 411.0 MW(e)  
**Design Discharge Burnup:** 28600 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 2636.7 GW(e)·h  
**Energy Availability Factor:** 87.6%  
**Load Factor:** 73.2%  
**Operating Factor:** 88.0%  
**Energy Unavailability Factor:** 12.4%  
**Total Off-line Time:** 1049 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	307.9	275.9	161.6	0.0	268.5	163.2	137.8	278.4	213.6	230.0	306.5	293.4	2636.7
<b>EAF (%)</b>	100.0	100.0	54.9	0.4	95.7	100.0	100.0	100.0	99.8	100.0	100.0	100.0	87.6
<b>UCF (%)</b>	100.0	100.0	54.9	0.4	95.7	100.0	100.0	100.0	99.8	100.0	100.0	100.0	87.6
<b>LF (%)</b>	100.7	99.9	52.8	0.0	87.8	55.1	45.1	91.0	72.2	75.1	103.6	95.9	73.2
<b>OF (%)</b>	100.0	100.0	55.0	0.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.0
<b>EUf (%)</b>	0.0	0.0	45.1	99.6	4.3	0.0	0.0	0.0	0.2	0.0	0.0	0.0	12.4
<b>PUf (%)</b>	0.0	0.0	45.1	99.6	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN NOVEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 9097 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.03.18 TO 2014.04.30. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1977  
**Date of First Criticality:** 07 Feb 1981  
**Date of Grid Connection:** 24 Mar 1981  
**Date of Commercial Operation:** 03 Dec 1982

**Lifetime Generation:** 82324.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 74.9%  
**Cumulative Load Factor:** 69.1%  
**Cumulative Unit Capability Factor:** 81.9%  
**Cumulative Energy Unavailability Factor:** 25.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1982	301.9	411	99.4	99.4	99.3	99.3	98.7	98.7	744	100.0
1983	2459.9	411	72.0	74.1	72.0	74.1	68.3	70.7	6818	77.8
1984	2830.7	411	82.7	78.3	82.7	78.2	78.4	74.4	7610	86.6
1985	2972.6	411	86.8	81.0	86.7	81.0	82.6	77.0	7814	89.2
1986	2627.3	411	74.1	79.3	74.1	79.3	73.0	76.0	7244	82.7
1987	2837.8	440	74.8	78.4	74.8	78.4	73.6	75.5	7024	80.2
1988	2933.2	411	81.5	78.9	81.4	78.9	81.2	76.5	7913	90.1
1989	3186.7	411	90.5	80.5	87.8	80.1	88.5	78.2	8047	91.9
1990	3256.9	411	89.8	81.6	89.7	81.3	90.5	79.7	8022	91.6
1991	2935.2	411	79.8	81.4	79.8	81.1	81.5	79.9	7188	82.1
1992	2806.4	411	87.9	82.1	87.8	81.8	77.7	79.7	7396	84.2
1993	2548.0	411	81.9	82.1	70.5	80.8	70.8	78.9	6833	78.0
1994	2466.0	411	70.9	81.2	70.8	79.9	68.5	78.0	6373	72.8
1995	2526.1	411	81.0	81.1	80.6	80.0	70.2	77.4	7083	80.9
1996	2327.3	411	79.8	81.0	79.8	80.0	64.5	76.5	6928	78.9
1997	2340.5	411	78.5	80.9	75.0	79.7	65.0	75.7	7114	81.2
1998	2006.3	411	86.3	81.2	56.3	78.2	55.7	74.5	6705	76.5
1999	2140.6	411	72.6	80.7	59.9	77.1	59.5	73.6	7040	80.4

2000	2244.7	411	87.9	81.1	62.5	76.3	62.2	73.0	7731	88.0
2001	2543.3	411	85.3	81.3	70.6	76.0	70.6	72.9	7057	80.6
2002	2742.4	411	91.4	81.8	75.9	76.0	76.2	73.0	7909	90.3
2003	2740.7	411	83.7	81.9	75.6	76.0	76.1	73.2	7335	83.7
2004	2816.8	411	88.1	82.2	77.4	76.1	78.0	73.4	7688	87.5
2005	2059.4	411	88.5	82.5	57.6	75.3	57.2	72.7	7672	87.6
2006	2294.6	411	90.0	82.8	64.0	74.8	63.7	72.3	7436	84.9
2007	1815.3	411	82.9	82.8	50.7	73.9	50.4	71.5	6506	74.3
2008	1876.7	411	83.8	82.8	83.8	74.2	52.0	70.7	7405	84.3
2009	2050.5	411	83.8	82.9	83.1	74.6	57.0	70.2	7340	83.8
2010	1979.2	411	71.5	82.4	71.5	74.5	55.0	69.7	6009	68.6
2011	2288.6	411	71.7	82.1	71.7	74.4	63.6	69.5	6405	73.1
2012	2226.2	411	78.1	81.9	78.1	74.5	61.7	69.2	6701	76.3
2013	2264.3	411	73.8	81.7	73.8	74.5	62.9	69.0	6396	73.0
2014	2636.7	411	87.6	81.9	87.6	74.9	73.2	69.1	7712	88.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					68	
C. Inspection, maintenance or repair combined with refuelling	1049			1190		
D. Inspection, maintenance or repair without refuelling				72		
E. Testing of plant systems or components				12	0	
J. Grid limitation, failure or grid unavailability						58
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						86
L. Human factor related					2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Z. Other					3	
Subtotal	1049	0	0	1274	73	144
Total		1049			1491	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		27
15. Reactor Cooling Systems		10
16. Steam generation systems		9
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		8
41. Main Generator Systems		0
42. Electrical Power Supply Systems		5
XX. Miscellaneous Systems		0
Total	0	64

## RU-33 KOLA-4

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 411.0 MW(e)  
**Design Net Capacity:** 411.0 MW(e)  
**Design Discharge Burnup:** 28600 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 2488.2 GW(e)·h  
**Energy Availability Factor:** 70.9%  
**Load Factor:** 69.1%  
**Operating Factor:** 71.2%  
**Energy Unavailability Factor:** 29.1%  
**Total Off-line Time:** 2520 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	313.1	286.6	319.5	294.2	178.7	0.0	0.0	0.0	196.7	294.8	320.6	284.0	2488.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	84.1	0.0	0.0	0.0	69.9	99.3	100.0	100.0	70.9
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	84.1	0.0	0.0	0.0	69.9	99.3	100.0	100.0	70.9
<b>LF (%)</b>	102.4	103.8	104.5	99.4	58.4	0.0	0.0	0.0	66.5	96.3	108.4	92.9	69.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	84.1	0.0	0.0	0.0	73.1	100.0	100.0	100.0	71.2
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	15.9	100.0	100.0	100.0	30.1	0.7	0.0	0.0	29.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	15.9	100.0	100.0	100.0	7.6	0.1	0.0	0.0	27.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.5	0.7	0.0	0.0	1.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - MARCH, SEPTEMBER, NOVEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 54165 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 2014.05.27 TO 2014.09.02. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1976  
**Date of First Criticality:** 07 Oct 1984  
**Date of Grid Connection:** 11 Oct 1984  
**Date of Commercial Operation:** 06 Dec 1984

**Lifetime Generation:** 77587.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 74.9%  
**Cumulative Load Factor:** 71.6%  
**Cumulative Unit Capability Factor:** 81.9%  
**Cumulative Energy Unavailability Factor:** 25.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	168.5	411	100.0	100.0	100.0	100.0	55.1	55.1	730	98.1
1985	2585.8	411	78.2	79.9	78.2	79.9	71.8	70.5	7751	88.5
1986	2690.2	411	72.4	76.3	72.4	76.3	74.7	72.5	7230	82.5
1987	3341.2	440	85.5	79.4	85.5	79.4	86.7	77.3	7861	89.7
1988	3124.2	411	85.0	80.7	84.9	80.7	86.5	79.6	7762	88.4
1989	3111.5	411	87.6	82.1	85.8	81.7	86.4	80.9	7793	89.0
1990	2930.4	411	80.3	81.8	80.2	81.5	81.4	81.0	7142	81.5
1991	2790.5	411	76.7	81.1	76.7	80.8	77.5	80.5	7429	84.8
1992	2764.9	411	80.5	81.0	80.0	80.7	76.6	80.0	7253	82.6
1993	2827.0	411	92.4	82.2	79.0	80.5	78.5	79.8	8247	94.1
1994	1939.8	411	62.7	80.3	55.8	78.1	53.9	77.3	5915	67.5
1995	2288.8	411	73.8	79.7	73.8	77.7	63.6	76.1	7022	80.2
1996	2537.7	411	84.1	80.1	84.1	78.2	70.3	75.6	7792	88.7
1997	2271.7	411	76.2	79.8	74.6	78.0	63.1	74.6	6848	78.2
1998	1927.6	411	69.4	79.1	49.2	75.9	53.5	73.1	6336	72.3
1999	2567.5	411	82.0	79.3	71.2	75.6	71.3	73.0	7193	82.1
2000	2177.5	411	86.3	79.7	60.4	74.7	60.3	72.2	7096	80.8
2001	2447.1	411	87.4	80.1	68.0	74.3	68.0	72.0	7149	81.6

2002	2601.7	411	79.7	80.1	71.5	74.1	72.3	72.0	7281	83.1
2003	2480.8	411	90.9	80.7	68.7	73.8	68.9	71.8	6663	76.1
2004	2391.6	411	86.8	81.0	66.4	73.5	66.2	71.6	7863	89.5
2005	2231.7	411	90.2	81.4	62.1	72.9	62.0	71.1	7879	89.9
2006	2573.1	411	84.1	81.5	71.3	72.9	71.5	71.1	7217	82.4
2007	2584.1	411	89.8	81.9	71.5	72.8	71.8	71.2	7640	87.2
2008	2793.5	411	85.2	82.0	85.2	73.3	77.4	71.4	7794	88.7
2009	2468.0	411	83.7	82.1	83.7	73.7	68.5	71.3	7538	86.1
2010	2956.7	411	84.7	82.2	84.7	74.1	82.1	71.7	7332	83.7
2011	2558.0	411	79.3	82.1	79.3	74.3	71.1	71.7	6803	77.7
2012	2601.7	411	84.7	82.2	84.7	74.7	72.1	71.7	7459	84.9
2013	2572.7	411	83.2	82.2	83.2	75.0	71.5	71.7	7084	80.9
2014	2488.2	411	70.9	81.9	70.9	74.9	69.1	71.6	6241	71.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		83			54	
C. Inspection, maintenance or repair combined with refuelling	2360			1070	19	
D. Inspection, maintenance or repair without refuelling				70		
E. Testing of plant systems or components	1			5		
J. Grid limitation, failure or grid unavailability						50
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						109
L. Human factor related		79			1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Z. Other					0	
Subtotal	2361	162	0	1145	74	159
Total		2523			1378	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		10
14. Safety Systems		7
15. Reactor Cooling Systems		4
16. Steam generation systems		11
17. Safety I&C Systems (excluding reactor I&C)		0
32. Feedwater and Main Steam System	83	3
42. Electrical Power Supply Systems		14
Total	83	51

# RU-17 KURSK-1

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 10000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6277.5 GW(e)·h  
**Energy Availability Factor:** 75.2%  
**Load Factor:** 77.5%  
**Operating Factor:** 78.1%  
**Energy Unavailability Factor:** 24.8%  
**Total Off-line Time:** 1915 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	721.8	648.7	714.8	0.0	0.0	220.8	523.2	667.6	636.6	714.4	700.0	729.7	6277.5
<b>EAF (%)</b>	99.9	99.0	100.0	0.5	0.0	34.8	76.6	96.9	95.0	100.0	100.0	100.0	75.2
<b>UCF (%)</b>	99.9	99.0	100.0	0.5	0.0	34.9	78.5	100.0	95.7	100.0	100.0	100.0	75.7
<b>LF (%)</b>	104.9	104.4	103.9	0.0	0.0	33.2	76.0	97.0	95.6	103.7	105.1	106.0	77.5
<b>OF (%)</b>	100.0	100.0	100.0	0.8	0.0	56.9	80.2	100.0	100.0	100.0	100.0	100.0	78.1
<b>EUf (%)</b>	0.1	1.0	0.0	99.5	100.0	65.2	23.4	3.1	5.0	0.0	0.0	0.0	24.8
<b>PUf (%)</b>	0.1	1.0	0.0	99.5	100.0	65.1	0.0	0.0	0.0	0.0	0.0	0.0	22.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	21.5	0.0	4.3	0.0	0.0	0.0	2.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.1	1.9	3.1	0.7	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - MARCH, AUGUST - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 169831 MWH. THE UNIT WAS IN THE ROUTINE MAINTENANCE OUTAGE FROM 2014.04.01 TO 2014.06.13. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1972  
**Date of First Criticality:** 25 Oct 1976  
**Date of Grid Connection:** 19 Dec 1976  
**Date of Commercial Operation:** 12 Oct 1977

**Lifetime Generation:** 191387.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 62.9%  
**Cumulative Load Factor:** 62.9%  
**Cumulative Unit Capability Factor:** 64.7%  
**Cumulative Energy Unavailability Factor:** 37.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	1458.9	925	79.1	79.1	79.1	79.1	71.4	71.4	1897	85.9
1978	5058.1	925	63.0	66.2	63.0	66.2	62.4	64.2	7573	86.4
1979	5930.2	925	73.9	69.7	73.1	69.3	73.2	68.2	7528	85.9
1980	6477.7	925	79.9	72.8	79.7	72.5	79.7	71.8	7669	87.3
1981	6132.8	925	76.4	73.7	76.4	73.4	75.7	72.7	7885	90.0
1982	7010.4	925	85.7	75.9	85.7	75.7	86.5	75.3	7788	88.9
1983	6720.3	925	82.2	76.9	82.2	76.8	82.9	76.5	7456	85.1
1984	6660.0	925	81.4	77.6	81.4	77.4	82.0	77.3	7369	83.9
1985	6346.8	925	76.9	77.5	76.8	77.3	78.3	77.4	7186	82.0
1986	5675.8	925	69.2	76.6	69.2	76.5	70.0	76.6	6598	75.3
1987	7022.7	1000	82.6	77.2	82.6	77.1	80.2	77.0	7407	84.6
1988	6638.0	925	81.7	77.6	81.7	77.5	81.7	77.4	7350	83.7
1989	5745.4	925	68.3	76.9	68.3	76.8	70.9	76.9	6582	75.1
1990	5090.5	925	65.7	76.0	65.7	75.9	62.8	75.8	6817	77.8
1991	4163.1	925	53.5	74.4	52.5	74.3	51.4	74.1	7038	80.3
1992	3669.2	925	46.3	72.6	46.3	72.5	45.2	72.2	6103	69.5
1993	4809.4	925	91.6	73.8	61.8	71.8	59.4	71.4	8145	93.0
1994	1560.6	925	20.6	70.7	19.8	68.8	19.3	68.4	2686	30.7

1995	0.0	925	0.0	66.8	0.0	65.1	0.0	64.7	0	0.0
1996	0.0	925	0.0	63.4	0.0	61.7	0.0	61.3	0	0.0
1997	27.8	925	0.5	60.3	0.5	58.7	0.3	58.3	61	0.7
1998	4508.6	925	59.3	60.2	57.4	58.6	55.6	58.2	7845	89.6
1999	4557.0	925	58.7	60.2	57.6	58.6	56.2	58.1	7464	85.2
2000	3449.7	925	44.3	59.5	43.6	57.9	42.5	57.5	5531	63.0
2001	1296.1	925	16.6	57.7	16.4	56.2	16.0	55.8	2042	23.3
2002	2462.7	925	32.5	56.7	30.8	55.2	30.4	54.8	3439	39.3
2003	6452.7	925	80.2	57.6	78.9	56.1	79.6	55.7	7262	82.9
2004	6601.3	925	83.0	58.6	81.1	57.0	81.2	56.6	7363	83.8
2005	6220.0	925	83.0	59.4	77.0	57.7	76.8	57.3	7651	87.3
2006	5837.7	925	78.4	60.1	72.2	58.2	72.0	57.8	7089	80.9
2007	6736.2	925	89.1	61.0	82.8	59.0	83.1	58.7	7670	87.6
2008	6464.6	925	84.4	61.8	81.4	59.8	79.6	59.3	7596	86.5
2009	7161.2	925	90.3	62.7	89.9	60.7	88.4	60.2	8068	92.1
2010	5640.7	925	69.7	62.9	69.5	61.0	69.6	60.5	5991	68.4
2011	7654.8	925	90.8	63.7	90.7	61.8	94.5	61.5	8620	98.4
2012	5988.7	925	71.7	63.9	71.2	62.1	73.7	61.9	6392	72.8
2013	6759.6	925	81.4	64.4	81.0	62.6	83.4	62.5	7217	82.4
2014	6277.5	925	75.7	64.7	75.2	62.9	77.5	62.9	6846	78.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		147			112	
C. Inspection, maintenance or repair combined with refuelling	1768			629		
D. Inspection, maintenance or repair without refuelling				1438		
E. Testing of plant systems or components				4		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				136		
H. Nuclear regulatory requirements					9	
J. Grid limitation, failure or grid unavailability						10
L. Human factor related					6	
Z. Other					4	
Subtotal	1768	147	0	2207	131	10
Total		1915			2348	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		38
13. Reactor Auxiliary Systems		1
15. Reactor Cooling Systems		16
16. Steam generation systems	147	2
17. Safety I&C Systems (excluding reactor I&C)		3
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		8
35. All other I&C Systems		0
41. Main Generator Systems		1
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		17
Total	147	106



## RU-22 KURSK-2

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 10000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6299.8 GW(e)·h  
**Energy Availability Factor:** 77.7%  
**Load Factor:** 77.7%  
**Operating Factor:** 80.0%  
**Energy Unavailability Factor:** 22.3%  
**Total Off-line Time:** 1750 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	0.0	568.8	305.3	696.1	662.4	653.1	636.3	658.3	698.9	692.1	728.4	6299.8
<b>EAF (%)</b>	0.0	0.9	94.6	46.3	99.5	98.8	95.0	92.5	98.5	99.5	100.0	100.0	77.7
<b>UCF (%)</b>	0.0	0.9	94.6	46.3	99.5	99.0	98.8	97.2	100.0	99.5	100.0	100.0	78.5
<b>LF (%)</b>	0.0	0.0	82.6	45.8	101.2	99.5	94.9	92.5	98.8	101.4	103.9	105.8	77.7
<b>OF (%)</b>	0.0	3.9	100.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.0
<b>EUUF (%)</b>	100.0	99.1	5.4	53.7	0.5	1.2	5.0	7.5	1.5	0.5	0.0	0.0	22.3
<b>PUF (%)</b>	100.0	99.1	5.4	53.7	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.5	0.0	1.2	2.8	0.0	0.5	0.0	0.0	0.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.2	3.8	4.7	1.5	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN MARCH - JUNE, SEPTEMBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 86150 MWH. THE UNIT WAS IN THE ROUTINE MAINTENANCE OUTAGE FROM 2014.01.01 TO 2014.02.27. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1973  
**Date of First Criticality:** 16 Dec 1978  
**Date of Grid Connection:** 28 Jan 1979  
**Date of Commercial Operation:** 17 Aug 1979

**Lifetime Generation:** 184239.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 63.6%  
**Cumulative Load Factor:** 63.7%  
**Cumulative Unit Capability Factor:** 65.8%  
**Cumulative Energy Unavailability Factor:** 36.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979	2303.9	925	67.7	67.7	67.7	67.7	67.8	67.8	3070	83.6
1980	6404.3	925	79.0	75.7	78.4	75.3	78.8	75.6	7658	87.2
1981	6385.9	925	78.7	76.9	78.7	76.7	78.8	76.9	7874	89.9
1982	5875.8	925	71.1	75.2	71.1	75.1	72.5	75.6	6443	73.6
1983	5707.6	925	70.1	74.1	70.1	73.9	70.4	74.5	7104	81.1
1984	6326.5	925	77.1	74.6	77.1	74.5	77.9	75.1	7219	82.2
1985	6459.9	925	79.4	75.4	79.4	75.3	79.7	75.8	7598	86.7
1986	5617.3	925	69.1	74.5	69.1	74.4	69.3	74.9	6575	75.1
1987	7196.7	1000	83.3	75.6	83.3	75.6	82.2	75.9	7539	86.1
1988	5725.7	925	73.9	75.5	73.9	75.4	70.5	75.3	6609	75.2
1989	6164.2	925	74.9	75.4	74.9	75.3	76.1	75.4	6797	77.6
1990	4789.7	925	62.2	74.3	62.2	74.2	59.1	73.9	6874	78.5
1991	4376.0	925	56.3	72.8	55.3	72.7	54.0	72.4	7361	84.0
1992	2158.4	925	27.2	69.4	27.2	69.3	26.6	69.0	3552	40.4
1993	4438.2	925	85.0	70.5	57.1	68.5	54.8	68.0	7432	84.8
1994	4212.2	925	55.3	69.5	53.5	67.5	52.0	66.9	7385	84.3
1995	4745.4	925	90.8	70.8	59.8	67.0	58.6	66.4	7708	88.0
1996	4196.1	925	52.8	69.8	52.7	66.2	51.6	65.6	7099	80.8

1997	4354.3	925	55.3	69.0	54.9	65.6	53.7	65.0	7076	80.8
1998	1685.1	925	21.7	66.6	21.3	63.3	20.8	62.7	2805	32.0
1999	3708.1	925	48.0	65.7	46.8	62.5	45.8	61.9	6066	69.2
2000	3668.1	925	48.9	64.9	46.2	61.8	45.1	61.1	6211	70.7
2001	4768.1	925	61.1	64.7	60.1	61.7	58.8	61.0	7667	87.5
2002	3027.8	925	38.3	63.6	38.1	60.7	37.4	60.0	4770	54.5
2003	3756.2	925	47.1	62.9	46.4	60.1	46.4	59.4	5834	66.6
2004	3692.1	925	45.1	62.2	45.0	59.5	45.4	58.9	4318	49.2
2005	6896.6	925	87.5	63.2	84.7	60.5	85.1	59.9	7782	88.8
2006	6574.4	925	82.9	63.9	80.3	61.2	81.1	60.6	7320	83.6
2007	5728.7	925	70.0	64.1	69.5	61.5	70.7	61.0	6207	70.9
2008	6835.7	925	82.6	64.7	82.6	62.2	84.1	61.8	7351	83.7
2009	6428.2	925	76.7	65.1	76.6	62.7	79.3	62.4	6778	77.4
2010	7448.7	925	88.1	65.9	87.8	63.5	91.9	63.3	8076	92.2
2011	6368.7	925	75.4	66.1	75.3	63.8	78.6	63.8	6539	74.7
2012	7402.0	925	88.0	66.8	87.8	64.5	91.1	64.6	7802	88.8
2013	1584.4	925	18.3	65.4	18.3	63.2	19.6	63.3	1606	18.3
2014	6299.8	925	78.5	65.8	77.7	63.6	77.7	63.7	7011	80.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1979 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		0			107	
C. Inspection, maintenance or repair combined with refuelling	1390			1120		
D. Inspection, maintenance or repair without refuelling				717		
E. Testing of plant systems or components	360			4		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				114		
J. Grid limitation, failure or grid unavailability						5
L. Human factor related					3	
Z. Other					33	
Subtotal	1750	0	0	1955	143	5
Total	1750			2103		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1979 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	0	45
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		5
14. Safety Systems		1
15. Reactor Cooling Systems		15
16. Steam generation systems		3
17. Safety I&C Systems (excluding reactor I&C)		2
32. Feedwater and Main Steam System	0	4
41. Main Generator Systems		2
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		16
Total	0	102

## RU-38 KURSK-3

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 10000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6970.0 GW(e)·h  
**Energy Availability Factor:** 84.3%  
**Load Factor:** 86.0%  
**Operating Factor:** 85.7%  
**Energy Unavailability Factor:** 15.7%  
**Total Off-line Time:** 1255 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	723.6	618.4	715.5	655.9	649.6	660.2	189.7	0.0	645.4	704.6	689.5	717.5	6970.0
<b>EAF (%)</b>	100.0	95.7	100.0	96.7	97.8	99.1	28.6	0.3	96.2	100.0	100.0	100.0	84.3
<b>UCF (%)</b>	100.0	95.7	100.0	96.7	98.5	100.0	29.4	0.3	96.2	100.0	100.0	100.0	84.5
<b>LF (%)</b>	105.1	99.5	104.0	98.5	94.4	99.1	27.6	0.0	96.9	102.2	103.5	104.3	86.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	29.6	1.7	100.0	100.0	100.0	100.0	85.7
<b>EUf (%)</b>	0.0	4.3	0.0	3.3	2.2	0.9	71.4	99.7	3.8	0.0	0.0	0.0	15.7
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	70.6	64.5	0.0	0.0	0.0	0.0	11.5
<b>UCLF (%)</b>	0.0	4.3	0.0	3.3	1.5	0.0	0.0	35.2	3.8	0.0	0.0	0.0	4.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.7	0.9	0.8	0.0	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - JUNE, SEPTEMBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 178275 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.07.10 TO 2014.08.21. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1978  
**Date of First Criticality:** 09 Aug 1983  
**Date of Grid Connection:** 17 Oct 1983  
**Date of Commercial Operation:** 30 Mar 1984

**Lifetime Generation:** 183413.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 73.0%  
**Cumulative Load Factor:** 72.7%  
**Cumulative Unit Capability Factor:** 74.0%  
**Cumulative Energy Unavailability Factor:** 27.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	4811.2	925	75.0	75.0	75.0	75.0	70.8	70.8	5800	79.0
1985	6260.8	925	77.9	76.6	77.6	76.4	77.3	74.3	7250	82.8
1986	4810.8	925	60.4	70.9	60.0	70.6	59.4	69.1	6269	71.6
1987	5458.9	1000	69.0	70.4	66.4	69.5	62.3	67.2	6185	70.6
1988	6693.6	925	83.6	73.1	83.6	72.4	82.4	70.3	7471	85.1
1989	5900.5	925	74.3	73.3	74.3	72.7	72.8	70.7	7200	82.2
1990	6889.4	925	86.5	75.2	86.5	74.7	85.0	72.8	8096	92.4
1991	5139.0	925	63.4	73.7	63.2	73.2	63.4	71.6	5704	65.1
1992	6630.5	925	82.1	74.7	82.1	74.2	81.6	72.7	8126	92.5
1993	5562.3	925	71.2	74.3	70.3	73.8	68.6	72.3	6438	73.5
1994	5077.9	925	73.6	74.2	66.7	73.2	62.7	71.4	6495	74.1
1995	5318.1	925	65.7	73.5	65.4	72.5	65.6	70.9	5974	68.2
1996	6739.3	925	82.9	74.3	82.7	73.3	82.9	71.9	7383	84.1
1997	6548.7	925	82.5	74.8	81.6	73.9	80.8	72.5	7325	83.6
1998	4528.3	925	60.3	73.9	56.5	72.7	55.9	71.4	5405	61.7
1999	6006.9	925	75.3	74.0	74.3	72.8	74.1	71.6	6749	77.0
2000	6382.3	925	78.8	74.2	78.3	73.2	78.5	72.0	7415	84.4
2001	3535.2	925	44.7	72.6	43.5	71.5	43.6	70.4	3948	45.1

2002	6699.8	925	88.2	73.4	85.1	72.2	82.7	71.1	7788	88.9
2003	5100.6	925	62.2	72.9	61.8	71.7	62.9	70.6	5469	62.4
2004	6894.2	925	86.3	73.5	84.3	72.3	84.8	71.3	7660	87.2
2005	4987.1	925	63.5	73.1	61.3	71.8	61.5	70.9	5598	63.9
2006	6711.2	925	83.4	73.5	81.9	72.3	82.8	71.4	7353	83.9
2007	5765.3	925	73.7	73.5	71.1	72.2	71.1	71.4	6535	74.6
2008	2117.4	925	26.8	71.6	26.8	70.4	26.1	69.6	2374	27.0
2009	7621.0	925	93.9	72.5	93.8	71.3	94.1	70.5	8216	93.8
2010	6048.6	925	71.8	72.5	71.7	71.3	74.6	70.7	6352	72.5
2011	7574.4	925	90.8	73.1	90.4	72.0	93.5	71.5	8228	93.9
2012	6207.2	925	75.4	73.2	74.8	72.1	76.4	71.7	6900	78.6
2013	7264.1	925	87.2	73.7	87.0	72.6	89.6	72.3	8022	91.6
2014	6970.0	925	84.5	74.0	84.3	73.0	86.0	72.7	7506	85.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		273			142	
C. Inspection, maintenance or repair combined with refuelling	1004			1017		
D. Inspection, maintenance or repair without refuelling				823		
E. Testing of plant systems or components				1		
J. Grid limitation, failure or grid unavailability						9
Subtotal	1004	273	0	1841	142	9
Total		1277			1992	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	273	18
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		3
14. Safety Systems		13
15. Reactor Cooling Systems		61
16. Steam generation systems		2
17. Safety I&C Systems (excluding reactor I&C)		3
21. Fuel Handling and Storage Facilities		5
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		11
41. Main Generator Systems		11
42. Electrical Power Supply Systems		3
Total	273	137

## RU-39 KURSK-4

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 10000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7517.8 GW(e)·h  
**Energy Availability Factor:** 89.7%  
**Load Factor:** 92.8%  
**Operating Factor:** 93.6%  
**Energy Unavailability Factor:** 10.3%  
**Total Off-line Time:** 559 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	734.4	657.9	726.3	698.4	692.5	607.2	595.6	564.2	139.1	664.2	703.9	734.1	7517.8
<b>EAF (%)</b>	100.0	100.0	100.0	99.9	99.5	90.5	87.2	82.5	22.5	93.5	99.9	100.0	89.7
<b>UCF (%)</b>	100.0	100.0	100.0	99.9	100.0	90.6	89.1	85.2	22.5	93.5	99.9	100.0	90.1
<b>LF (%)</b>	106.7	105.8	105.5	104.9	100.6	91.2	86.5	82.0	20.9	96.5	105.7	106.7	92.8
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	91.8	91.5	100.0	44.6	94.9	100.0	100.0	93.6
<b>EUf (%)</b>	0.0	0.0	0.0	0.1	0.5	9.5	12.8	17.5	77.5	6.5	0.1	0.0	10.3
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.8	77.5	0.0	0.1	0.0	7.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.1	0.0	9.4	10.9	0.0	0.0	6.5	0.0	0.0	2.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.5	0.1	2.0	2.6	0.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - JUNE, AUGUST - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 238749 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 2014.09.11 TO 2014.09.27. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 May 1981  
**Date of First Criticality:** 31 Oct 1985  
**Date of Grid Connection:** 02 Dec 1985  
**Date of Commercial Operation:** 05 Feb 1986

**Lifetime Generation:** 180153.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 76.0%  
**Cumulative Load Factor:** 76.6%  
**Cumulative Unit Capability Factor:** 77.1%  
**Cumulative Energy Unavailability Factor:** 24.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	5952.3	925	80.8	80.8	80.4	80.4	80.3	80.3	7059	88.1
1987	6167.7	1000	72.4	76.3	72.3	76.0	70.4	74.9	6704	76.5
1988	6653.0	925	81.7	78.1	81.7	77.9	81.9	77.3	7390	84.1
1989	6131.8	925	76.0	77.6	76.0	77.4	75.7	76.9	6954	79.4
1990	6050.0	925	73.7	76.8	73.6	76.7	74.7	76.4	6922	79.0
1991	7356.1	925	92.5	79.4	90.3	78.9	90.8	78.8	8469	96.7
1992	6117.4	925	75.4	78.9	75.4	78.4	75.3	78.3	7324	83.4
1993	5638.3	925	71.7	78.0	71.0	77.5	69.6	77.2	6439	73.5
1994	5369.4	925	71.5	77.3	67.0	76.3	66.3	76.0	6255	71.4
1995	6207.5	925	78.6	77.4	77.0	76.4	76.6	76.1	7001	79.9
1996	6590.2	925	81.4	77.8	80.2	76.7	81.1	76.5	7373	83.9
1997	5971.7	925	73.9	77.4	73.1	76.4	73.7	76.3	6664	76.1
1998	6641.4	925	86.7	78.1	82.3	76.9	82.0	76.7	7751	88.5
1999	5895.4	925	74.2	77.9	72.8	76.6	72.8	76.4	6595	75.3
2000	6778.8	925	83.5	78.2	82.8	77.0	83.4	76.9	7423	84.5
2001	6671.6	925	82.2	78.5	81.5	77.3	82.3	77.2	7281	83.1
2002	5531.0	925	68.3	77.9	67.6	76.7	68.3	76.7	6094	69.6
2003	6233.4	925	77.3	77.8	75.8	76.7	76.9	76.7	6802	77.6

2004	5422.9	925	68.0	77.3	66.7	76.1	66.7	76.2	6005	68.4
2005	7081.1	925	89.4	77.9	87.1	76.7	87.4	76.8	7858	89.7
2006	3636.4	925	44.8	76.4	44.2	75.2	44.9	75.2	4115	47.0
2007	7426.5	925	94.3	77.2	91.2	75.9	91.7	76.0	8298	94.7
2008	6052.4	925	74.9	77.1	73.9	75.8	74.5	75.9	6580	74.9
2009	4184.3	925	52.5	76.0	52.3	74.8	51.6	74.9	4786	54.6
2010	7557.1	925	91.7	76.7	91.3	75.5	93.3	75.6	8109	92.6
2011	5500.7	925	64.5	76.2	64.5	75.1	67.9	75.3	5729	65.4
2012	7470.4	925	89.4	76.7	89.2	75.6	91.9	76.0	8144	92.7
2013	6213.9	925	74.8	76.6	74.3	75.5	76.7	76.0	6807	77.7
2014	7517.8	925	90.1	77.1	89.7	76.0	92.8	76.6	8201	93.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		162			59	
C. Inspection, maintenance or repair combined with refuelling	399			1129		
D. Inspection, maintenance or repair without refuelling				485		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				94		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					6	
Z. Other					6	
Subtotal	399	162	0	1708	71	0
Total		561			1779	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems	123	13
15. Reactor Cooling Systems		11
16. Steam generation systems		0
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		8
42. Electrical Power Supply Systems	39	18
Total	162	58

# RU-15 LENINGRAD-1

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6020.7 GW(e)·h  
**Energy Availability Factor:** 74.4%  
**Load Factor:** 74.3%  
**Operating Factor:** 81.7%  
**Energy Unavailability Factor:** 25.6%  
**Total Off-line Time:** 1602 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	592.6	639.3	706.6	669.6	702.6	237.1	0.0	297.3	525.9	553.4	537.5	558.8	6020.7
<b>EAF (%)</b>	92.6	100.0	98.9	99.1	100.0	35.1	0.0	44.7	80.0	80.9	81.2	83.2	74.4
<b>UCF (%)</b>	92.6	100.0	98.9	99.1	100.0	35.1	0.0	44.7	80.2	80.9	81.2	83.2	74.5
<b>LF (%)</b>	86.1	102.8	102.7	100.5	102.1	35.6	0.0	43.2	79.0	80.3	80.7	81.2	74.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	35.1	0.0	47.4	100.0	100.0	100.0	100.0	81.7
<b>EUf (%)</b>	7.4	0.0	1.1	0.9	0.0	64.9	100.0	55.3	20.0	19.1	18.8	16.8	25.6
<b>PUf (%)</b>	7.4	0.0	1.1	0.0	0.0	59.9	100.0	55.3	19.8	19.1	18.8	16.8	25.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.9	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - JUNE, AUGUST, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 75275 MWH. THE UNIT WAS IN THE ROUTINE MAINTENANCE OUTAGE FROM 2014.06.13 TO 2014.08.17. UNIT POWER REDUCTION AS PER ADDENDUM NO. 20 TO CONDITIONS AND TERMS OF LICENSE NO. GN-03-101-2249 DATED 18.01.2010 GRANTED BY FEDERAL AUTHORITY FOR ECOLOGICAL, TECHNOLOGICAL AND NUCLEAR SAFETY FROM 2014.01.01 TO 2014.01.31. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1970 **Lifetime Generation:** 221659.0 GW(e)·h  
**Date of First Criticality:** 12 Sep 1973 **Cumulative Energy Availability Factor:** 67.7%  
**Date of Grid Connection:** 21 Dec 1973 **Cumulative Load Factor:** 67.3%  
**Date of Commercial Operation:** 01 Nov 1974 **Cumulative Unit Capability Factor:** 68.3%  
**Cumulative Energy Unavailability Factor:** 32.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	1022.6	925	76.5	76.5	76.5	76.5	75.5	75.5	1378	94.1
1975	3998.9	925	50.6	54.3	50.6	54.3	49.4	53.1	6661	76.0
1976	4098.2	925	51.5	53.0	51.5	53.0	50.4	51.9	6137	69.9
1977	5941.8	925	74.1	59.7	74.1	59.7	73.3	58.6	8192	93.5
1978	5413.7	925	67.3	61.5	67.3	61.5	66.8	60.6	6735	76.9
1979	6322.0	925	78.7	64.8	78.7	64.8	78.0	64.0	7973	91.0
1980	5542.1	925	68.5	65.4	68.3	65.4	68.2	64.7	6574	74.8
1981	6414.7	925	79.8	67.4	79.5	67.4	79.2	66.7	8018	91.5
1982	5709.6	925	70.8	67.8	70.8	67.8	70.5	67.1	6665	76.1
1983	7164.8	925	88.0	70.0	87.5	69.9	88.4	69.5	7803	89.1
1984	6650.1	925	82.0	71.2	81.7	71.1	81.8	70.7	7321	83.3
1985	7008.1	925	86.5	72.6	86.3	72.5	86.5	72.1	8059	92.0
1986	5924.1	925	73.3	72.6	73.3	72.5	73.1	72.2	6677	76.2
1987	8113.0	1000	93.5	74.3	92.7	74.2	92.6	73.8	8255	94.2
1988	6620.3	925	81.7	74.9	81.7	74.7	81.5	74.4	7519	85.6

1989	4577.0	925	56.4	73.6	56.0	73.5	56.5	73.2	4993	57.0
1990	0.0	925	0.0	69.1	0.0	69.0	0.0	68.7	0	0.0
1991	3934.0	925	49.9	68.0	49.9	67.8	48.5	67.5	6385	72.9
1992	7191.6	925	88.6	69.1	88.1	69.0	88.5	68.7	7995	91.0
1993	6520.4	925	83.5	69.9	81.7	69.6	80.5	69.3	7354	83.9
1994	5531.2	925	77.7	70.3	77.6	70.0	68.3	69.3	6956	79.4
1995	0.0	925	0.0	67.0	0.0	66.7	0.0	66.0	0	0.0
1996	3852.8	925	47.6	66.1	47.5	65.9	47.4	65.2	4454	50.7
1997	6872.4	925	88.6	67.1	86.1	66.7	84.8	66.0	7785	88.9
1998	5630.3	925	69.8	67.2	68.8	66.8	69.5	66.1	6220	71.0
1999	6637.9	925	81.8	67.7	81.3	67.4	81.9	66.8	7431	84.8
2000	6317.8	925	78.5	68.2	77.2	67.8	77.8	67.2	7069	80.5
2001	7097.8	925	89.2	68.9	87.4	68.5	87.6	67.9	7923	90.4
2002	5824.6	925	72.4	69.1	71.2	68.6	71.9	68.1	7104	81.1
2003	7446.3	925	95.0	69.9	92.2	69.4	91.9	68.9	8495	97.0
2004	1328.5	925	18.2	68.2	16.7	67.6	16.4	67.2	1715	19.5
2005	7145.4	925	93.5	69.0	88.5	68.3	88.2	67.8	8255	94.2
2006	6802.1	925	83.9	69.5	83.9	68.8	83.9	68.3	7651	87.3
2007	7538.3	925	93.1	70.2	92.0	69.5	93.0	69.1	8306	94.8
2008	5848.7	925	72.6	70.3	72.6	69.6	72.0	69.2	6421	73.1
2009	7616.0	925	95.3	71.0	95.1	70.3	94.0	69.9	8385	95.7
2010	6345.2	925	78.2	71.2	78.2	70.5	78.3	70.1	6912	78.9
2011	4766.1	925	61.8	70.9	58.2	70.2	58.8	69.8	5269	60.2
2012	2199.1	925	27.5	69.8	27.5	69.1	27.1	68.7	3025	34.4
2013	519.8	925	6.9	68.2	6.8	67.5	6.4	67.1	876	10.0
2014	6020.7	925	74.5	68.3	74.4	67.7	74.3	67.3	7159	81.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		37			102	
C. Inspection, maintenance or repair combined with refuelling	1567			1044		
D. Inspection, maintenance or repair without refuelling				884	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				6	15	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				165		
L. Human factor related					8	
Z. Other					5	7
Subtotal	1567	37	0	2099	130	7
Total		1604			2236	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems	37	15
14. Safety Systems		6
15. Reactor Cooling Systems		28
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		7
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System		3
35. All other I&C Systems		2
41. Main Generator Systems		2
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		17
Total	37	97



## RU-16 LENINGRAD-2

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 3214.0 GW(e)·h  
**Energy Availability Factor:** 40.5%  
**Load Factor:** 39.7%  
**Operating Factor:** 50.3%  
**Energy Unavailability Factor:** 59.5%  
**Total Off-line Time:** 4355 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	527.7	469.7	527.9	451.0	81.6	0.0	0.0	0.0	0.0	0.0	472.1	683.9	3214.0
<b>EAF (%)</b>	77.6	80.0	78.7	69.0	13.2	0.0	0.0	0.0	0.0	0.0	71.6	99.4	40.5
<b>UCF (%)</b>	79.3	80.0	79.1	69.4	13.4	0.0	0.0	0.0	0.0	0.0	71.6	99.4	40.8
<b>LF (%)</b>	76.7	75.6	76.7	67.7	11.9	0.0	0.0	0.0	0.0	0.0	70.9	99.4	39.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	25.9	0.0	0.0	0.0	0.0	0.0	81.8	100.0	50.3
<b>EUAF (%)</b>	22.4	20.0	21.3	31.0	86.8	100.0	100.0	100.0	100.0	100.0	28.4	0.6	59.5
<b>PUF (%)</b>	20.0	20.0	19.9	30.6	86.6	100.0	100.0	100.0	100.0	100.0	17.6	0.0	58.2
<b>UCLF (%)</b>	0.7	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8	0.6	1.1
<b>XUF (%)</b>	1.7	0.1	0.3	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - JUNE, AUGUST, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 4187 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 2014.05.09 TO 2014.11.05. UNIT POWER REDUCTION AS PER ADDENDUM NO. 15 TO CONDITIONS AND TERMS OF LICENSE &#8470; GN-03-101-2250 DATED 18.01.2010 GRANTED BY FEDERAL AUTHORITY FOR ECOLOGICAL, TECHNOLOGICAL AND NUCLEAR SAFETY FROM 2014.01.01 TO 2014.05.03. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Jun 1970 **Lifetime Generation:** 220802.0 GW(e)·h  
**Date of First Criticality:** 06 May 1975 **Cumulative Energy Availability Factor:** 69.6%  
**Date of Grid Connection:** 11 Jul 1975 **Cumulative Load Factor:** 69.3%  
**Date of Commercial Operation:** 11 Feb 1976 **Cumulative Unit Capability Factor:** 70.4%  
**Cumulative Energy Unavailability Factor:** 30.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1976	4873.3	925	67.9	67.9	67.9	67.9	65.5	65.5	6910	85.9
1977	5413.7	925	67.2	67.5	67.1	67.5	66.8	66.2	7337	83.8
1978	6310.8	925	78.8	71.4	78.8	71.3	77.9	70.2	8008	91.4
1979	5633.7	925	70.1	71.0	70.1	71.0	69.5	70.0	6954	79.4
1980	6351.8	925	78.8	72.6	78.6	72.6	78.2	71.7	7960	90.6
1981	5177.2	925	62.0	70.8	62.0	70.8	63.9	70.4	6057	69.1
1982	7266.8	925	90.4	73.7	89.9	73.5	89.7	73.2	8125	92.8
1983	6790.8	925	84.2	75.0	83.6	74.8	83.8	74.5	7479	85.4
1984	7145.9	925	87.6	76.4	87.4	76.2	87.9	76.0	7881	89.7
1985	5962.6	925	74.4	76.2	74.3	76.0	73.6	75.8	6604	75.4
1986	7152.3	925	88.4	77.3	88.1	77.1	88.3	76.9	7914	90.3
1987	7228.2	1000	83.7	77.9	83.0	77.7	82.5	77.4	7513	85.8
1988	6814.9	925	83.6	78.3	83.6	78.1	83.9	77.9	7417	84.4
1989	6111.5	925	75.8	78.2	75.6	77.9	75.4	77.7	7102	81.1
1990	5998.3	925	75.5	78.0	75.3	77.8	74.0	77.5	8125	92.8

1991	4410.8	925	56.4	76.6	56.3	76.4	54.4	76.1	7204	82.2
1992	0.0	925	0.0	72.1	0.0	71.9	0.0	71.6	0	0.0
1993	0.0	925	0.0	68.1	0.0	67.9	0.0	67.6	0	0.0
1994	164.1	925	2.3	64.6	2.3	64.5	2.0	64.1	660	7.5
1995	6812.0	925	93.4	66.1	86.2	65.6	84.1	65.1	8280	94.5
1996	7244.9	925	89.4	67.2	89.1	66.7	89.2	66.3	7922	90.2
1997	6587.1	925	83.1	67.9	82.6	67.4	81.3	67.0	7342	83.8
1998	5916.7	925	73.4	68.2	72.5	67.6	73.0	67.2	6643	75.8
1999	6557.8	925	80.6	68.7	80.2	68.1	80.9	67.8	7299	83.3
2000	7252.5	925	90.1	69.5	88.6	69.0	89.3	68.7	7972	90.8
2001	7073.5	925	88.5	70.3	86.6	69.6	87.3	69.4	7904	90.2
2002	7024.9	925	88.7	70.9	86.6	70.3	86.7	70.0	7961	90.9
2003	7134.4	925	90.9	71.7	88.0	70.9	88.0	70.7	8298	94.7
2004	6711.5	925	86.4	72.2	82.9	71.3	82.6	71.1	7832	89.2
2005	3763.2	925	50.1	71.4	46.6	70.5	46.4	70.3	4557	52.0
2006	1461.4	925	18.1	69.7	18.1	68.8	18.0	68.6	1760	20.1
2007	6461.4	925	80.1	70.0	79.0	69.1	79.7	68.9	7077	80.8
2008	7017.5	925	88.3	70.6	88.1	69.7	86.4	69.5	7810	88.9
2009	7278.6	925	93.8	71.3	93.4	70.4	89.8	70.0	8310	94.9
2010	6434.7	925	80.0	71.5	79.6	70.7	79.4	70.3	7352	83.9
2011	7751.0	925	94.4	72.2	94.3	71.3	95.7	71.0	8362	95.5
2012	5326.2	925	65.5	72.0	65.5	71.2	65.6	70.9	6317	71.9
2013	3311.3	925	42.4	71.2	41.6	70.4	40.9	70.1	5181	59.1
2014	3214.0	925	40.8	70.4	40.5	69.6	39.7	69.3	4406	50.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1976 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		35			78	
C. Inspection, maintenance or repair combined with refuelling	4321			825		
D. Inspection, maintenance or repair without refuelling				820		
E. Testing of plant systems or components				2	1	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				282		
L. Human factor related					2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Subtotal	4321	35	0	1929	81	1
Total		4356			2011	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1976 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		5
15. Reactor Cooling Systems		15
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		1
35. All other I&C Systems		1
41. Main Generator Systems	35	1
42. Electrical Power Supply Systems		5
XX. Miscellaneous Systems		20
Total	35	72

## RU-34 LENINGRAD-3

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7199.4 GW(e)·h  
**Energy Availability Factor:** 89.7%  
**Load Factor:** 88.8%  
**Operating Factor:** 93.9%  
**Energy Unavailability Factor:** 10.3%  
**Total Off-line Time:** 532 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	650.0	647.1	708.1	654.2	541.6	661.0	673.5	510.9	200.8	626.4	646.7	679.0	7199.4
<b>EAF (%)</b>	99.8	100.0	100.0	100.0	84.6	99.2	97.9	74.9	32.0	89.0	99.9	99.1	89.7
<b>UCF (%)</b>	99.9	100.0	100.0	100.0	84.6	99.9	100.0	76.9	32.0	89.0	99.9	99.1	90.1
<b>LF (%)</b>	94.5	104.1	102.9	98.2	78.7	99.3	97.9	74.2	30.2	90.9	97.1	98.7	88.8
<b>OF (%)</b>	100.0	100.0	100.0	100.0	86.4	100.0	100.0	77.6	63.3	100.0	100.0	100.0	93.9
<b>EUf (%)</b>	0.2	0.0	0.0	0.0	15.4	0.8	2.1	25.1	68.0	11.0	0.1	0.9	10.3
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.1	38.7	0.0	0.0	0.0	5.1
<b>UCLF (%)</b>	0.2	0.0	0.0	0.0	15.4	0.1	0.0	0.0	29.3	11.0	0.2	0.9	4.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.7	2.1	2.0	0.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - AUGUST, OCTOBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 118688 MWH. THE UNIT WAS IN THE ROUTINE MAINTENANCE OUTAGE FROM 2014.08.25 TO 2014.09.11. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Dec 1973      **Lifetime Generation:** 201550.0 GW(e)·h  
**Date of First Criticality:** 17 Sep 1979      **Cumulative Energy Availability Factor:** 72.0%  
**Date of Grid Connection:** 07 Dec 1979      **Cumulative Load Factor:** 71.0%  
**Date of Commercial Operation:** 29 Jun 1980      **Cumulative Unit Capability Factor:** 73.0%  
**Cumulative Energy Unavailability Factor:** 28.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	3623.6	925	77.4	77.4	77.4	77.4	76.3	76.3	4488	87.4
1981	6553.6	925	81.7	80.1	81.3	79.9	80.9	79.2	7528	85.9
1982	6413.3	925	80.8	80.4	80.3	80.0	79.1	79.2	7448	85.0
1983	5708.4	925	71.3	77.8	70.9	77.5	70.4	76.7	6809	77.7
1984	7214.9	925	89.8	80.4	89.2	80.1	88.8	79.4	8060	91.8
1985	6831.9	925	85.4	81.3	84.9	80.9	84.3	80.3	7835	89.4
1986	6890.9	925	86.4	82.1	85.9	81.7	85.0	81.0	7935	90.6
1987	6010.3	1000	70.4	80.5	69.4	79.9	68.6	79.2	6362	72.6
1988	6951.7	925	86.5	81.2	86.5	80.7	85.6	80.0	7885	89.8
1989	6938.1	925	86.2	81.7	85.9	81.2	85.6	80.6	7455	85.1
1990	7531.9	925	93.0	82.7	92.4	82.3	93.0	81.7	8280	94.5
1991	6506.6	925	80.6	82.6	80.6	82.1	80.3	81.6	7197	82.2
1992	5516.6	925	68.5	81.4	68.4	81.0	67.9	80.5	6122	69.7
1993	7143.8	925	90.1	82.1	88.9	81.6	88.2	81.1	7966	90.9
1994	6631.8	925	92.4	82.8	91.0	82.3	81.8	81.1	8135	92.9
1995	3586.0	925	49.4	80.7	46.5	80.0	44.3	78.8	4332	49.5
1996	0.0	925	0.0	75.8	0.0	75.2	0.0	74.0	0	0.0
1997	0.0	925	0.0	71.5	0.0	70.9	0.0	69.8	0	0.0

1998	1386.5	925	17.5	68.6	17.4	68.1	17.1	67.0	1610	18.4
1999	7853.1	925	99.7	70.2	97.1	69.5	96.9	68.5	8701	99.3
2000	6352.8	925	79.6	70.7	78.2	70.0	78.2	69.0	7169	81.6
2001	6173.5	925	78.9	71.0	76.6	70.3	76.2	69.3	7007	80.0
2002	2514.7	925	33.6	69.4	31.9	68.6	31.0	67.7	3332	38.0
2003	6729.2	925	86.6	70.1	84.5	69.2	83.0	68.3	8100	92.5
2004	6909.1	925	90.9	71.0	86.5	69.9	85.0	69.0	8426	95.9
2005	4447.3	925	61.5	70.6	61.1	69.6	54.9	68.4	5397	61.6
2006	7332.1	925	89.9	71.3	89.9	70.4	90.5	69.3	8274	94.5
2007	3756.0	925	54.1	70.7	47.0	69.5	46.4	68.4	4820	55.0
2008	5013.6	925	62.7	70.4	62.7	69.3	61.7	68.2	5632	64.1
2009	5336.1	925	70.6	70.4	70.4	69.3	65.9	68.1	6209	70.9
2010	7303.2	925	92.9	71.2	92.6	70.1	90.1	68.8	8261	94.3
2011	6803.3	925	83.8	71.6	83.7	70.5	84.0	69.3	7548	86.2
2012	7401.4	925	91.7	72.2	91.6	71.1	91.1	70.0	8115	92.4
2013	6892.3	925	83.9	72.5	83.6	71.5	85.1	70.4	7446	85.0
2014	7199.4	925	90.1	73.0	89.7	72.0	88.8	71.0	8229	93.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		101			109	
C. Inspection, maintenance or repair combined with refuelling	436			640		
D. Inspection, maintenance or repair without refuelling				1090		
E. Testing of plant systems or components				0	19	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				149		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				91		
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						4
L. Human factor related					3	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other					1	
Subtotal	436	101	0	1970	132	6
Total		537			2108	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems		4
14. Safety Systems		1
15. Reactor Cooling Systems		6
16. Steam generation systems		1
17. Safety I&C Systems (excluding reactor I&C)		6
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	101	60
32. Feedwater and Main Steam System		4
41. Main Generator Systems		2
42. Electrical Power Supply Systems		12
Total	101	106

## RU-35 LENINGRAD-4

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6942.5 GW(e)·h  
**Energy Availability Factor:** 85.9%  
**Load Factor:** 85.7%  
**Operating Factor:** 87.5%  
**Energy Unavailability Factor:** 14.1%  
**Total Off-line Time:** 1096 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	628.6	558.9	708.5	675.1	183.3	124.6	694.4	674.9	674.5	700.1	637.9	681.7	6942.5
<b>EAF (%)</b>	98.5	87.7	99.1	99.4	28.5	20.5	99.6	98.1	100.0	99.4	100.0	99.6	85.9
<b>UCF (%)</b>	98.5	87.7	99.1	99.5	28.5	20.6	100.0	98.6	100.0	99.5	100.0	99.6	86.0
<b>LF (%)</b>	91.3	89.9	103.0	101.4	26.6	18.7	100.9	98.1	101.3	101.6	95.8	99.1	85.7
<b>OF (%)</b>	100.0	89.0	100.0	100.0	29.2	31.3	100.0	100.0	100.0	100.0	100.0	100.0	87.5
<b>EUf (%)</b>	1.5	12.3	0.9	0.6	71.5	79.5	0.4	1.9	0.0	0.6	0.0	0.4	14.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	71.5	62.8	0.0	0.0	0.0	0.0	0.0	0.0	11.2
<b>UCLF (%)</b>	1.5	12.3	0.9	0.6	0.0	16.6	0.0	1.4	0.0	0.6	0.0	0.4	2.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 134786 MWH. THE UNIT WAS IN THE ROUTINE MAINTENANCE OUTAGE FROM 2014.05.09 TO 2014.06.18. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1975  
**Date of First Criticality:** 29 Dec 1980  
**Date of Grid Connection:** 09 Feb 1981  
**Date of Commercial Operation:** 29 Aug 1981

**Lifetime Generation:** 191294.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 73.3%  
**Cumulative Load Factor:** 72.4%  
**Cumulative Unit Capability Factor:** 74.4%  
**Cumulative Energy Unavailability Factor:** 26.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	2582.8	925	76.9	76.9	76.9	76.9	76.0	76.0	3169	86.3
1982	6715.2	925	83.7	81.7	83.6	81.6	82.9	80.8	7609	86.9
1983	6844.2	925	86.1	83.5	85.3	83.1	84.5	82.3	8159	93.1
1984	6126.3	925	74.9	81.0	74.4	80.6	75.4	80.3	6803	77.4
1985	7335.3	925	91.2	83.3	90.9	82.9	90.5	82.6	8309	94.9
1986	7060.9	925	88.7	84.3	87.6	83.8	87.1	83.5	7826	89.3
1987	7319.2	1000	85.0	84.4	84.1	83.9	83.6	83.5	7530	86.0
1988	6050.4	925	74.8	83.1	74.8	82.6	74.5	82.3	6667	75.9
1989	7409.7	925	91.9	84.2	91.5	83.7	91.4	83.3	8185	93.4
1990	7762.6	925	96.1	85.4	95.4	84.9	95.8	84.7	8588	98.0
1991	6130.7	925	76.8	84.6	76.1	84.1	75.7	83.8	6870	78.4
1992	5618.1	925	70.8	83.4	70.3	82.9	69.2	82.5	6617	75.3
1993	6735.7	925	87.6	83.7	85.3	83.1	83.1	82.6	7762	88.6
1994	6167.1	925	83.2	83.7	82.1	83.0	76.1	82.1	7340	83.8
1995	6141.0	925	86.1	83.9	83.0	83.0	75.8	81.7	7270	83.0
1996	7079.7	925	88.8	84.2	88.3	83.3	87.1	82.0	8048	91.6
1997	7644.7	925	98.2	85.0	95.9	84.1	94.3	82.8	8760	100.0
1998	3682.0	925	47.3	82.9	46.0	81.9	45.4	80.6	4341	49.6

1999	0.0	925	0.0	78.4	0.0	77.5	0.0	76.3	0	0.0
2000	0.0	925	0.0	74.4	0.0	73.5	0.0	72.4	0	0.0
2001	3585.7	925	45.5	73.0	44.6	72.1	44.3	71.0	4387	50.1
2002	7528.5	925	97.6	74.1	93.9	73.1	92.9	72.0	8760	100.0
2003	1957.2	925	26.0	72.0	24.7	71.0	24.2	69.9	2399	27.4
2004	7232.2	925	92.3	72.8	89.6	71.8	89.0	70.7	8243	93.8
2005	6730.1	925	89.3	73.5	83.8	72.3	83.0	71.2	7838	89.5
2006	5611.9	925	69.4	73.3	69.4	72.1	69.3	71.1	6197	70.7
2007	4827.4	925	64.8	73.0	59.7	71.7	59.6	70.7	5713	65.2
2008	7526.2	925	94.9	73.8	94.7	72.5	92.6	71.5	8714	99.2
2009	4052.8	925	53.4	73.1	53.2	71.8	50.0	70.7	4695	53.6
2010	5222.4	925	64.2	72.8	64.0	71.6	64.4	70.5	5798	66.2
2011	6589.8	925	81.0	73.1	80.8	71.9	81.3	70.9	7177	81.9
2012	7559.9	925	92.3	73.7	92.3	72.5	93.0	71.6	8254	94.0
2013	6992.9	925	85.9	74.1	85.8	72.9	86.3	72.0	7739	88.3
2014	6942.5	925	86.0	74.4	85.9	73.3	85.7	72.4	7665	87.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		137			79	
C. Inspection, maintenance or repair combined with refuelling	961			1277		
D. Inspection, maintenance or repair without refuelling				247		
E. Testing of plant systems or components					0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				187		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				118	40	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						9
L. Human factor related					0	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					0	
Z. Other					22	1
Subtotal	961	137	0	1829	141	11
Total		1098			1981	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems	74	18
14. Safety Systems		0
15. Reactor Cooling Systems		18
16. Steam generation systems		7
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		4
41. Main Generator Systems	63	2
42. Electrical Power Supply Systems		10
Total	137	75

## RU-9 NOVOVORONEZH-3

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 385.0 MW(e)  
**Design Net Capacity:** 385.0 MW(e)  
**Design Discharge Burnup:** 28600 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 3071.2 GW(e)·h  
**Energy Availability Factor:** 89.7%  
**Load Factor:** 91.1%  
**Operating Factor:** 91.6%  
**Energy Unavailability Factor:** 10.3%  
**Total Off-line Time:** 740 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	299.8	268.1	294.6	250.0	9.2	261.5	274.6	273.3	273.4	289.6	281.3	295.9	3071.2
<b>EAF (%)</b>	99.8	100.0	100.0	90.3	4.9	94.3	95.8	95.5	97.9	100.0	100.0	100.0	89.7
<b>UCF (%)</b>	99.8	100.0	100.0	90.3	4.9	96.7	99.3	99.3	98.9	100.0	100.0	100.0	90.6
<b>LF (%)</b>	104.7	103.6	102.9	90.2	3.2	94.3	95.8	95.4	98.6	101.0	101.5	103.3	91.1
<b>OF (%)</b>	100.0	100.0	100.0	90.6	9.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.6
<b>EUf (%)</b>	0.2	0.0	0.0	9.7	95.1	5.7	4.2	4.5	2.1	0.0	0.0	0.0	10.3
<b>PUf (%)</b>	0.0	0.0	0.0	9.7	95.1	2.7	0.0	0.0	0.0	0.0	0.0	0.0	9.1
<b>UCLF (%)</b>	0.2	0.0	0.0	0.0	0.0	0.6	0.7	0.7	1.1	0.0	0.0	0.0	0.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	2.4	3.5	3.8	1.0	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - APRIL, SEPTEMBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 52988 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.04.28 TO 2014.05.29. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Jul 1967  
**Date of First Criticality:** 22 Dec 1971  
**Date of Grid Connection:** 27 Dec 1971  
**Date of Commercial Operation:** 29 Jun 1972

**Lifetime Generation:** 103227.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 71.9%  
**Cumulative Load Factor:** 71.2%  
**Cumulative Unit Capability Factor:** 72.6%  
**Cumulative Energy Unavailability Factor:** 28.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1972	1319.4	385	76.7	76.7	76.7	76.7	66.7	66.7	4397	85.6
1973	1877.2	385	57.9	64.8	57.9	64.8	55.7	59.7	7114	81.2
1974	2630.0	385	79.0	70.3	79.0	70.3	78.0	66.8	7990	91.2
1975	1967.9	385	58.0	66.9	58.0	66.9	58.4	64.4	6695	76.4
1976	2221.4	385	66.6	66.8	66.6	66.8	65.7	64.7	7534	85.8
1977	2786.3	385	82.1	69.6	82.1	69.6	82.6	67.9	7851	89.6
1978	2903.8	385	85.8	72.0	85.8	72.0	86.1	70.7	7962	90.9
1979	2632.9	385	77.9	72.8	77.9	72.8	78.1	71.7	7477	85.4
1980	2844.6	385	84.2	74.1	84.2	74.1	84.3	73.1	8246	94.1
1981	2827.2	385	84.0	75.1	84.0	75.1	83.8	74.2	7934	90.6
1982	2770.5	385	82.6	75.8	82.6	75.8	82.1	75.0	8037	91.7
1983	2470.0	385	74.1	75.7	74.1	75.7	73.2	74.8	7158	81.7
1984	3056.5	385	89.8	76.8	89.8	76.8	90.4	76.1	8185	93.2
1985	3003.8	385	88.9	77.7	88.9	77.7	89.1	77.0	8195	93.6
1986	2705.5	385	80.5	77.9	80.5	77.9	80.2	77.3	8048	91.9
1987	2321.9	417	66.5	77.1	66.5	77.1	63.6	76.3	6361	72.6
1988	2906.1	385	91.0	77.9	91.0	77.9	85.9	76.9	8110	92.3
1989	1984.6	385	66.0	77.3	66.0	77.3	58.8	75.9	6040	68.9

1990	2767.4	385	85.6	77.7	84.4	77.7	82.1	76.2	8611	98.3
1991	1614.0	385	49.2	76.3	48.7	76.2	47.9	74.8	5176	59.1
1992	2580.4	385	76.9	76.3	76.2	76.2	76.3	74.8	6991	79.6
1993	1810.5	385	53.8	75.3	53.0	75.1	53.7	73.9	4991	57.0
1994	2714.6	385	82.0	75.6	79.1	75.3	80.5	74.1	7300	83.3
1995	1364.0	385	41.3	74.1	40.6	73.8	40.4	72.7	3945	45.0
1996	1947.0	385	58.8	73.5	57.1	73.1	57.6	72.1	5510	62.7
1997	2624.0	385	79.7	73.7	77.4	73.3	77.8	72.3	7075	80.8
1998	2535.6	385	76.4	73.8	74.3	73.3	75.2	72.4	6822	77.9
1999	1919.3	385	61.4	73.4	57.1	72.8	56.9	71.9	5669	64.7
2000	2621.5	385	79.8	73.6	77.2	72.9	77.5	72.1	7131	81.2
2001	1293.4	385	38.5	72.4	38.2	71.7	38.3	70.9	3529	40.3
2002	2431.9	385	72.6	72.4	71.9	71.7	72.1	71.0	6415	73.2
2003	2335.0	385	69.6	72.3	68.9	71.7	69.2	70.9	6236	71.2
2004	2313.6	385	71.3	72.3	69.7	71.6	68.4	70.8	7282	82.9
2005	2472.1	385	75.7	72.4	74.2	71.7	73.3	70.9	7233	82.6
2006	2684.0	385	82.5	72.7	80.1	71.9	79.6	71.2	7621	87.0
2007	1713.5	385	52.4	72.1	52.3	71.4	50.8	70.6	6153	70.2
2008	1866.6	385	58.2	71.7	57.2	71.0	55.2	70.2	7584	86.3
2009	1835.5	385	56.1	71.3	55.3	70.6	54.4	69.8	5295	60.4
2010	2467.3	385	75.5	71.4	74.2	70.7	73.2	69.8	7746	88.4
2011	2971.2	385	87.9	71.9	87.1	71.1	88.1	70.3	7739	88.4
2012	2486.3	385	72.8	71.9	72.5	71.1	73.5	70.4	6476	73.7
2013	2893.5	385	85.2	72.2	84.7	71.4	85.8	70.8	7556	86.3
2014	3071.2	385	90.6	72.6	89.7	71.9	91.1	71.2	8021	91.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					215	
C. Inspection, maintenance or repair combined with refuelling	744			1384	5	
D. Inspection, maintenance or repair without refuelling				120		
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					0	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					4	
Z. Other					5	
Subtotal	744	0	0	1504	229	2
Total		744			1735	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		72
12. Reactor I&C Systems		11
15. Reactor Cooling Systems		1
16. Steam generation systems		95
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		9
35. All other I&C Systems		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		20
Total	0	210



# RU-11 NOVOVORONEZH-4

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 385.0 MW(e)  
**Design Net Capacity:** 385.0 MW(e)  
**Design Discharge Burnup:** 28600 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 3061.1 GW(e)·h  
**Energy Availability Factor:** 89.3%  
**Load Factor:** 90.8%  
**Operating Factor:** 90.5%  
**Energy Unavailability Factor:** 10.7%  
**Total Off-line Time:** 829 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	297.9	270.9	296.8	279.1	279.6	268.3	274.0	272.7	172.7	61.2	289.0	299.1	3061.1
<b>EAF (%)</b>	99.5	100.0	100.0	100.0	98.1	97.5	96.3	95.7	62.7	22.6	100.0	100.0	89.3
<b>UCF (%)</b>	99.5	100.0	100.0	100.0	100.0	100.0	99.8	99.4	63.7	22.6	100.0	100.0	90.3
<b>LF (%)</b>	104.0	104.7	103.6	100.7	97.6	96.8	95.6	95.2	62.3	21.3	104.2	104.4	90.8
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.9	23.6	100.0	100.0	90.5
<b>EUf (%)</b>	0.5	0.0	0.0	0.0	1.9	2.5	3.7	4.3	37.3	77.4	0.0	0.0	10.7
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.3	77.4	0.0	0.0	9.6
<b>UCLF (%)</b>	0.5	0.0	0.0	0.0	0.0	0.0	0.2	0.6	0.0	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.9	2.5	3.5	3.7	1.1	0.0	0.0	0.0	1.1

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - APRIL, OCTOBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 69347 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.09.20 TO 2014.10.24. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1967  
**Date of First Criticality:** 25 Dec 1972  
**Date of Grid Connection:** 28 Dec 1972  
**Date of Commercial Operation:** 24 Mar 1973

**Lifetime Generation:** 111361.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 78.8%  
**Cumulative Load Factor:** 78.5%  
**Cumulative Unit Capability Factor:** 80.2%  
**Cumulative Energy Unavailability Factor:** 21.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	2360.2	385	85.8	85.8	85.8	85.8	83.5	83.5	6838	93.1
1974	2411.8	385	71.3	77.9	71.3	77.9	71.5	77.0	7159	81.7
1975	2644.9	385	75.6	77.1	75.6	77.1	78.4	77.5	7950	90.8
1976	2924.1	385	84.5	79.0	84.5	79.0	86.5	79.8	7963	90.7
1977	2822.9	385	81.3	79.5	81.3	79.5	83.7	80.6	7637	87.2
1978	2658.5	385	78.2	79.3	78.2	79.3	78.8	80.3	7388	84.3
1979	2442.2	385	72.4	78.3	72.4	78.3	72.4	79.2	6888	78.6
1980	2842.9	385	84.1	79.0	84.1	79.0	84.1	79.8	7690	87.5
1981	3019.9	385	90.0	80.3	90.0	80.3	89.6	80.9	8278	94.5
1982	2797.5	385	83.9	80.6	83.9	80.6	82.9	81.1	8278	94.5
1983	2950.3	385	89.2	81.4	89.2	81.4	87.5	81.7	8216	93.8
1984	2974.1	385	87.9	82.0	87.9	82.0	87.9	82.2	7982	90.9
1985	3097.9	385	91.3	82.7	91.3	82.7	91.9	83.0	8250	94.2
1986	2792.2	385	82.6	82.7	82.6	82.7	82.8	83.0	7688	87.8
1987	3262.7	417	91.7	83.3	91.7	83.3	89.3	83.4	8252	94.2
1988	2529.4	385	80.0	83.1	80.0	83.1	74.8	82.9	7152	81.4
1989	2710.3	385	90.2	83.5	90.2	83.5	80.4	82.7	8357	95.4
1990	2244.7	385	70.5	82.8	69.6	82.8	66.6	81.8	6622	75.6

1991	1827.6	385	58.2	81.5	58.0	81.5	54.2	80.4	5540	63.2
1992	2853.4	385	87.3	81.8	82.4	81.5	84.4	80.6	8163	92.9
1993	2613.7	385	79.7	81.7	76.6	81.3	77.5	80.4	7204	82.2
1994	1954.3	385	66.9	81.0	56.6	80.1	57.9	79.4	6033	68.9
1995	2120.0	385	65.5	80.4	62.2	79.4	62.9	78.7	5818	66.4
1996	3080.3	385	93.8	80.9	90.4	79.8	91.1	79.2	8362	95.2
1997	2235.5	385	70.3	80.5	67.0	79.3	66.3	78.7	6690	76.4
1998	2714.9	385	83.2	80.6	80.2	79.3	80.5	78.7	7366	84.1
1999	1791.5	385	54.9	79.6	53.2	78.4	53.1	77.8	4927	56.2
2000	2474.3	385	74.6	79.5	73.1	78.2	73.2	77.6	6784	77.2
2001	2656.0	385	80.7	79.5	79.2	78.2	78.8	77.7	7173	81.9
2002	2184.8	385	65.4	79.0	64.2	77.8	64.8	77.2	5857	66.9
2003	2583.1	385	78.8	79.0	76.8	77.7	76.6	77.2	6950	79.3
2004	2714.0	385	83.7	79.2	80.8	77.8	80.3	77.3	7685	87.5
2005	2433.4	385	75.3	79.1	73.1	77.7	72.2	77.2	7228	82.5
2006	2575.1	385	81.3	79.1	76.5	77.6	76.4	77.1	7636	87.2
2007	2290.3	385	69.1	78.8	67.9	77.4	67.9	76.9	6488	74.1
2008	2876.3	385	84.0	79.0	83.4	77.5	85.1	77.1	7464	85.0
2009	2931.8	385	86.3	79.2	85.2	77.7	86.9	77.4	7580	86.5
2010	2928.7	385	87.5	79.4	85.8	77.9	86.8	77.6	7727	88.2
2011	2707.6	385	82.1	79.5	80.6	78.0	80.3	77.7	7263	82.9
2012	2944.9	385	87.9	79.7	87.1	78.2	87.1	77.9	7707	87.7
2013	3039.0	385	90.4	79.9	89.4	78.5	90.1	78.2	7929	90.5
2014	3061.1	385	90.3	80.2	89.3	78.8	90.8	78.5	7932	90.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1973 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					70	
C. Inspection, maintenance or repair combined with refuelling	829			1066		
D. Inspection, maintenance or repair without refuelling				105		
E. Testing of plant systems or components				13		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				64		
J. Grid limitation, failure or grid unavailability						9
L. Human factor related					2	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					9	
Z. Other				2	15	
Subtotal	829	0	0	1250	96	9
Total		829			1355	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1973 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		15
13. Reactor Auxiliary Systems		2
15. Reactor Cooling Systems		1
16. Steam generation systems		31
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		9
42. Electrical Power Supply Systems		0
XX. Miscellaneous Systems		0
Total	0	67

# RU-20 NOVOVORONEZH-5

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6193.6 GW(e)·h  
**Energy Availability Factor:** 74.4%  
**Load Factor:** 74.4%  
**Operating Factor:** 88.0%  
**Energy Unavailability Factor:** 25.6%  
**Total Off-line Time:** 1049 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	721.7	563.0	401.6	688.6	709.5	685.1	86.6	189.1	458.3	601.4	575.9	512.7	6193.6
<b>EAF (%)</b>	100.0	87.1	58.8	98.9	99.9	100.0	13.1	28.6	68.0	84.4	83.8	72.9	74.4
<b>UCF (%)</b>	100.0	87.1	58.8	98.9	100.0	100.0	13.1	28.6	68.1	84.4	83.8	72.9	74.4
<b>LF (%)</b>	102.1	88.2	56.8	100.7	100.4	100.2	12.2	26.8	67.0	85.0	84.2	72.5	74.4
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	13.4	58.5	100.0	87.1	100.0	100.0	88.0
<b>EUf (%)</b>	0.0	12.9	41.2	1.1	0.1	0.0	86.9	71.4	32.0	15.6	16.2	27.1	25.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	86.9	70.5	32.0	0.0	0.0	0.0	16.0
<b>UCLF (%)</b>	0.0	12.9	41.2	1.1	0.0	0.0	0.0	0.9	0.0	15.6	16.2	27.1	9.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - JULY, SEPTEMBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 72144 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.07.05 TO 2014.08.13. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1974  
**Date of First Criticality:** 30 Apr 1980  
**Date of Grid Connection:** 31 May 1980  
**Date of Commercial Operation:** 20 Feb 1981

**Lifetime Generation:** 174606.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 64.0%  
**Cumulative Load Factor:** 63.8%  
**Cumulative Unit Capability Factor:** 64.8%  
**Cumulative Energy Unavailability Factor:** 36.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	4254.5	950	56.4	56.4	56.4	56.4	55.9	55.9	6213	77.5
1982	5042.8	950	60.9	58.7	60.9	58.7	60.6	58.3	6631	75.7
1983	6607.5	950	79.5	65.9	79.5	65.9	79.4	65.6	7716	88.1
1984	6979.6	950	83.4	70.4	83.4	70.4	83.6	70.2	7742	88.1
1985	6894.3	950	83.1	73.0	83.1	73.0	82.8	72.8	7979	91.1
1986	5523.8	950	66.0	71.8	65.9	71.8	66.4	71.7	6806	77.7
1987	7052.7	1000	81.8	73.3	81.8	73.3	80.5	73.0	7399	84.5
1988	3017.8	950	36.5	68.7	36.5	68.7	36.2	68.4	3439	39.2
1989	3308.9	950	40.9	65.6	40.9	65.6	39.8	65.2	3778	43.1
1990	3913.3	950	47.7	63.8	47.6	63.8	47.0	63.4	4715	53.8
1991	5878.2	950	71.5	64.5	71.5	64.5	70.6	64.0	6996	79.9
1992	3752.8	950	45.9	62.9	45.7	62.9	45.0	62.4	5244	59.7
1993	5935.4	950	73.8	63.8	72.6	63.6	71.3	63.1	7448	85.0
1994	2281.9	950	33.2	61.6	28.9	61.2	27.4	60.6	4288	48.9
1995	4753.7	950	63.9	61.7	57.5	60.9	57.1	60.3	6670	76.1
1996	3861.8	950	46.7	60.8	46.7	60.0	46.3	59.5	4759	54.2
1997	5949.3	950	71.7	61.4	71.4	60.7	71.5	60.2	6854	78.2
1998	3771.8	950	45.5	60.5	44.9	59.8	45.3	59.3	4457	50.9

1999	4845.4	950	61.2	60.6	58.7	59.8	58.2	59.3	6062	69.2
2000	5278.6	950	65.6	60.8	63.5	59.9	63.3	59.5	6479	73.8
2001	5984.6	950	73.2	61.4	72.3	60.5	71.9	60.1	7508	85.7
2002	6762.2	950	83.1	62.4	80.7	61.4	81.3	61.0	7430	84.8
2003	6951.2	950	84.5	63.4	83.1	62.4	83.5	62.0	7507	85.7
2004	3610.6	950	43.6	62.5	43.1	61.6	43.3	61.2	4032	45.9
2005	2544.3	950	31.4	61.3	30.6	60.3	30.6	60.0	2861	32.7
2006	7264.4	950	87.8	62.3	86.7	61.4	87.3	61.1	7762	88.6
2007	6556.3	950	79.8	63.0	78.5	62.0	78.8	61.7	7140	81.5
2008	7285.2	950	87.0	63.8	86.9	62.9	87.3	62.6	7718	87.9
2009	6518.1	950	77.9	64.3	77.6	63.4	78.3	63.2	6865	78.4
2010	5585.3	950	69.1	64.5	67.0	63.5	67.1	63.3	6404	73.1
2011	2085.8	950	25.1	63.2	25.1	62.3	25.1	62.1	2422	27.7
2012	7014.6	950	83.7	63.8	83.6	62.9	84.1	62.8	7457	84.9
2013	7205.4	950	86.2	64.5	86.0	63.6	86.6	63.5	7773	88.7
2014	6193.6	950	74.4	64.8	74.4	64.0	74.4	63.8	7712	88.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		96			701	
C. Inspection, maintenance or repair combined with refuelling	953			1378		
D. Inspection, maintenance or repair without refuelling				454		
L. Human factor related					1	
Z. Other					10	
Subtotal	953	96	0	1832	712	0
Total		1049			2544	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		283
12. Reactor I&C Systems		22
13. Reactor Auxiliary Systems		6
14. Safety Systems		2
15. Reactor Cooling Systems	96	49
16. Steam generation systems		245
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		7
35. All other I&C Systems		6
41. Main Generator Systems		58
42. Electrical Power Supply Systems		3
XX. Miscellaneous Systems		7
Total	96	695

# RU-59 ROSTOV-1

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 7227.7 GW(e)·h  
**Energy Availability Factor:** 85.1%  
**Load Factor:** 86.8%  
**Operating Factor:** 85.6%  
**Energy Unavailability Factor:** 14.9%  
**Total Off-line Time:** 1263 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	760.8	459.6	0.0	502.2	711.0	597.9	738.8	744.0	680.0	716.5	634.1	682.8	7227.7
<b>EAF (%)</b>	100.0	72.0	0.0	69.0	98.8	100.0	100.0	100.0	100.0	100.0	88.1	92.9	85.1
<b>UCF (%)</b>	100.0	75.2	0.0	69.0	98.8	100.0	100.0	100.0	100.0	100.0	88.1	92.9	85.4
<b>LF (%)</b>	107.6	72.0	0.0	73.4	100.6	87.4	104.5	105.3	99.4	101.2	92.7	96.6	86.8
<b>OF (%)</b>	100.0	75.4	0.0	69.6	100.0	100.0	100.0	100.0	100.0	100.0	88.3	93.1	85.6
<b>EUUF (%)</b>	0.0	28.0	100.0	31.0	1.2	0.0	0.0	0.0	0.0	0.0	11.9	7.1	14.9
<b>PUF (%)</b>	0.0	24.8	100.0	31.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	7.1	1.6
<b>XUF (%)</b>	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - FEBRUARY, APRIL - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 278945 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 2014.02.22 TO 2014.04.10. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1981  
**Date of First Criticality:** 23 Feb 2001  
**Date of Grid Connection:** 30 Mar 2001  
**Date of Commercial Operation:** 25 Dec 2001

**Lifetime Generation:** 101439.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 87.2%  
**Cumulative Load Factor:** 90.0%  
**Cumulative Unit Capability Factor:** 87.6%  
**Cumulative Energy Unavailability Factor:** 12.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2001	Data not provided									
2002	7176.2	950	85.5	85.5	84.1	84.1	86.2	86.2	7543	86.1
2003	6973.9	950	82.6	84.0	81.3	82.7	83.8	85.0	7154	81.7
2004	7439.3	950	88.0	85.3	87.8	84.4	89.1	86.4	7766	88.4
2005	7232.9	950	86.9	85.7	85.9	84.8	86.9	86.5	7628	87.1
2006	7216.4	950	84.2	85.4	83.8	84.6	86.7	86.6	7386	84.3
2007	7309.4	950	85.5	85.4	85.3	84.7	87.8	86.8	7536	86.0
2008	7745.7	950	88.6	85.9	88.5	85.2	92.8	87.6	7799	88.8
2009	7927.0	950	90.3	86.4	90.3	85.9	95.3	88.6	7916	90.4
2010	7398.5	950	88.9	86.7	88.6	86.2	88.9	88.6	7828	89.4
2011	7695.4	950	88.2	86.9	88.2	86.4	92.5	89.0	7736	88.3
2012	7569.0	950	86.5	86.8	86.4	86.4	90.7	89.2	7614	86.7
2013	8557.1	950	98.1	87.8	98.1	87.4	102.8	90.3	8618	98.4
2014	7227.7	950	85.4	87.6	85.1	87.2	86.8	90.0	7498	85.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost	2002 to 2014 Average Hours Lost Per Year
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	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		89			89	
C. Inspection, maintenance or repair combined with refuelling	1128			866		
D. Inspection, maintenance or repair without refuelling				10		
L. Human factor related		47			0	
Subtotal	1128	136	0	876	89	0
Total		1264			965	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2002 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		5
16. Steam generation systems		30
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		1
33. Circulating Water System		3
35. All other I&C Systems		0
41. Main Generator Systems		42
42. Electrical Power Supply Systems	89	2
Total	89	85

## RU-62 ROSTOV-2

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7741.4 GW(e)·h  
**Energy Availability Factor:** 91.2%  
**Load Factor:** 93.0%  
**Operating Factor:** 91.5%  
**Energy Unavailability Factor:** 8.8%  
**Total Off-line Time:** 743 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	149.3	510.4	760.3	735.6	641.2	650.7	714.0	729.0	681.2	713.3	716.1	740.3	7741.4
<b>EAF (%)</b>	21.7	75.4	100.0	100.0	98.6	100.0	100.0	100.0	100.0	99.7	98.6	100.0	91.2
<b>UCF (%)</b>	22.8	75.4	100.0	100.0	98.6	100.0	100.0	100.0	100.0	99.7	98.6	100.0	91.3
<b>LF (%)</b>	21.1	79.9	107.6	107.5	90.7	95.1	101.0	103.1	99.6	100.8	104.7	104.7	93.0
<b>OF (%)</b>	23.0	76.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.8	100.0	91.5
<b>EUUF (%)</b>	78.3	24.6	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.3	1.4	0.0	8.8
<b>PUF (%)</b>	77.2	24.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	8.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.2
<b>XUF (%)</b>	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN FEBRUARY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 304554 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.01.08 TO 2014.02.07. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 May 1983  
**Date of First Criticality:** 22 Jan 2010  
**Date of Grid Connection:** 18 Mar 2010  
**Date of Commercial Operation:** 10 Dec 2010

**Lifetime Generation:** 34679.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 90.5%  
**Cumulative Load Factor:** 91.3%  
**Cumulative Unit Capability Factor:** 90.7%  
**Cumulative Energy Unavailability Factor:** 9.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2010	692.2	950	100.0	100.0	100.0	100.0	97.9	97.9	744	100.0
2011	7368.4	950	90.2	91.0	89.4	90.2	88.6	89.3	7944	90.7
2012	7433.2	950	87.8	89.5	87.6	89.0	89.1	89.2	7781	88.6
2013	7832.7	950	92.8	90.5	92.8	90.2	94.1	90.8	8151	93.0
2014	7741.4	950	91.3	90.7	91.2	90.5	93.0	91.3	8018	91.5

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2010 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					18	
C. Inspection, maintenance or repair combined with refuelling	734			351		
D. Inspection, maintenance or repair without refuelling				115		
J. Grid limitation, failure or grid unavailability			9			
Subtotal	734	0	9	466	18	0

Total	743	484
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#### 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2010 to 2014 Average Hours Lost Per Year
41. Main Generator Systems		18
Total	0	18



# RU-23 SMOLENSK-1

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

## 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 7331.0 GW(e)·h  
**Energy Availability Factor:** 87.1%  
**Load Factor:** 90.5%  
**Operating Factor:** 87.8%  
**Energy Unavailability Factor:** 12.9%  
**Total Off-line Time:** 1070 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	730.4	651.1	0.0	382.7	675.2	684.2	689.5	680.0	676.8	721.3	705.8	734.1	7331.0
<b>EAF (%)</b>	100.0	98.5	0.1	55.9	94.1	100.0	99.4	98.1	100.0	100.0	100.0	100.0	87.1
<b>UCF (%)</b>	100.0	98.5	0.1	55.9	94.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.3
<b>LF (%)</b>	106.1	104.7	0.0	57.5	98.1	102.7	100.2	98.8	101.6	104.7	106.0	106.7	90.5
<b>OF (%)</b>	100.0	100.0	0.0	59.7	95.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.8
<b>EUf (%)</b>	0.0	1.5	99.9	44.1	5.9	0.0	0.6	1.9	0.0	0.0	0.0	0.0	12.9
<b>PUf (%)</b>	0.0	0.0	99.9	41.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9
<b>UCLF (%)</b>	0.0	1.5	0.1	2.6	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.9	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - FEBRUARY, APRIL - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 212993 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 2014.03.01 TO 2014.04.13. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1975  
**Date of First Criticality:** 10 Sep 1982  
**Date of Grid Connection:** 09 Dec 1982  
**Date of Commercial Operation:** 30 Sep 1983

**Lifetime Generation:** 187748.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 73.0%  
**Cumulative Load Factor:** 72.9%  
**Cumulative Unit Capability Factor:** 75.1%  
**Cumulative Energy Unavailability Factor:** 27.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	2275.4	925	99.7	99.7	99.7	99.7	84.0	84.0	2547	87.0
1984	6921.4	925	84.2	88.1	84.2	88.1	85.2	84.9	7830	89.1
1985	5850.2	925	74.9	82.4	72.4	81.4	72.2	79.5	6806	77.7
1986	3039.8	925	37.8	69.1	37.8	68.3	37.5	66.9	3472	39.6
1987	7445.8	1000	86.7	73.4	86.7	72.8	85.0	71.3	7620	87.0
1988	6695.6	925	81.9	75.0	81.9	74.5	82.4	73.4	7288	83.0
1989	6506.5	925	79.7	75.7	79.3	75.3	80.3	74.4	7177	81.9
1990	6227.8	925	76.6	75.8	76.1	75.4	76.9	74.8	6851	78.2
1991	6693.9	925	81.3	76.5	81.3	76.1	82.6	75.7	7252	82.8
1992	6849.4	925	83.7	77.2	83.7	76.9	84.3	76.6	7563	86.1
1993	6290.6	925	78.4	77.3	78.0	77.0	77.6	76.7	6993	79.8
1994	4217.8	925	71.0	76.8	57.8	75.3	52.1	74.6	6286	71.8
1995	5002.5	925	77.3	76.8	63.0	74.3	61.7	73.5	6390	72.9
1996	5666.4	925	71.7	76.5	71.6	74.1	69.7	73.2	6604	75.2
1997	4674.5	925	59.1	75.3	57.8	73.0	57.7	72.2	5366	61.3
1998	3554.1	925	58.8	74.2	45.0	71.2	43.9	70.3	5411	61.8
1999	6478.9	925	83.5	74.8	80.1	71.7	80.0	70.9	7417	84.7
2000	5228.5	925	64.4	74.2	63.8	71.3	64.3	70.5	5738	65.3

2001	5165.1	925	67.4	73.8	63.2	70.8	63.7	70.2	5940	67.8
2002	6866.7	925	85.1	74.4	83.7	71.5	84.7	70.9	7587	86.6
2003	6711.8	925	84.4	74.9	82.9	72.0	82.8	71.5	7533	86.0
2004	2337.1	925	29.1	72.7	28.5	70.0	28.8	69.5	2592	29.5
2005	7354.1	925	94.7	73.7	90.6	70.9	90.7	70.4	8414	96.0
2006	5417.1	925	67.1	73.4	67.1	70.8	66.9	70.3	6021	68.7
2007	6569.7	925	80.8	73.7	80.3	71.2	81.1	70.7	7138	81.5
2008	7794.9	925	95.2	74.6	94.9	72.1	95.9	71.7	8430	96.0
2009	6122.3	925	77.6	74.7	77.3	72.3	75.6	71.9	6974	79.6
2010	4896.3	925	61.8	74.2	61.1	71.9	60.4	71.5	5424	61.9
2011	5444.5	925	66.2	73.9	66.0	71.7	67.2	71.3	5899	67.3
2012	6306.8	925	76.3	74.0	75.9	71.8	77.6	71.5	6741	76.7
2013	7775.3	925	93.8	74.7	93.5	72.5	96.0	72.3	8267	94.4
2014	7331.0	925	87.3	75.1	87.1	73.0	90.5	72.9	7691	87.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		38			96	
C. Inspection, maintenance or repair combined with refuelling	1029			1080		
D. Inspection, maintenance or repair without refuelling				341		
E. Testing of plant systems or components				24		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				329		
J. Grid limitation, failure or grid unavailability						5
L. Human factor related					1	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						14
Subtotal	1029	38	0	1774	97	19
Total		1067			1890	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		17
12. Reactor I&C Systems	2	13
13. Reactor Auxiliary Systems		9
14. Safety Systems		11
15. Reactor Cooling Systems		27
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		9
42. Electrical Power Supply Systems	36	2
Total	38	91

## RU-24 SMOLENSK-2

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7821.2 GW(e)·h  
**Energy Availability Factor:** 94.3%  
**Load Factor:** 96.5%  
**Operating Factor:** 97.3%  
**Energy Unavailability Factor:** 5.7%  
**Total Off-line Time:** 237 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	634.9	658.4	725.0	690.7	705.3	661.0	679.9	684.1	680.2	724.0	323.6	654.2	7821.2
<b>EAF (%)</b>	100.0	100.0	100.0	98.7	99.3	97.9	98.5	98.4	100.0	100.0	48.4	89.7	94.3
<b>UCF (%)</b>	100.0	100.0	100.0	98.7	99.4	98.1	100.0	100.0	100.0	100.0	48.4	89.7	94.6
<b>LF (%)</b>	92.3	105.9	105.3	103.7	102.5	99.2	98.8	99.4	102.1	105.1	48.6	95.1	96.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	67.1	100.0	97.3
<b>EUf (%)</b>	0.0	0.0	0.0	1.3	0.7	2.1	1.5	1.6	0.0	0.0	51.6	10.3	5.7
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	10.3	3.6
<b>UCLF (%)</b>	0.0	0.0	0.0	1.3	0.6	1.9	0.0	0.0	0.0	0.0	18.3	0.0	1.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.2	1.5	1.6	0.0	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 193506 MWH. THE UNIT WAS IN THE ROUTINE MAINTENANCE OUTAGE FROM 2014.11.10 TO 2014.11.20. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 Jun 1976  
**Date of First Criticality:** 09 Apr 1985  
**Date of Grid Connection:** 31 May 1985  
**Date of Commercial Operation:** 02 Jul 1985

**Lifetime Generation:** 178771.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 74.6%  
**Cumulative Load Factor:** 74.5%  
**Cumulative Unit Capability Factor:** 76.8%  
**Cumulative Energy Unavailability Factor:** 25.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	3308.1	925	90.6	90.6	81.3	81.3	81.0	81.0	4059	91.9
1986	6667.3	925	82.6	85.3	82.6	82.2	82.3	81.8	7442	85.0
1987	6364.9	1000	74.5	80.8	74.5	79.0	72.7	78.0	6707	76.6
1988	6757.2	925	83.6	81.5	83.5	80.2	83.2	79.4	7594	86.5
1989	6627.3	925	81.9	81.6	81.5	80.5	81.8	80.0	7336	83.7
1990	6710.6	925	83.0	81.9	82.5	80.9	82.8	80.5	7453	85.1
1991	5796.7	925	71.4	80.3	71.4	79.4	71.5	79.1	6495	74.1
1992	6731.6	925	83.9	80.7	82.6	79.8	82.9	79.6	7472	85.1
1993	6634.1	925	84.9	81.2	82.7	80.2	81.9	79.9	7492	85.5
1994	5259.8	925	80.2	81.1	66.6	78.8	64.9	78.3	7044	80.4
1995	5337.4	925	80.3	81.1	66.8	77.6	65.9	77.1	6738	76.9
1996	6127.7	925	79.1	80.9	77.8	77.6	75.4	77.0	7010	79.8
1997	4991.0	925	61.7	79.4	61.6	76.4	61.6	75.8	5642	64.4
1998	5297.0	925	73.9	79.0	65.6	75.6	65.4	75.0	6576	75.1
1999	5362.5	925	69.1	78.3	66.0	74.9	66.2	74.4	6090	69.5
2000	6566.1	925	80.5	78.4	80.1	75.3	80.8	74.8	7108	80.9
2001	6457.6	925	81.0	78.6	79.0	75.5	79.7	75.1	7537	86.0
2002	3431.1	925	43.6	76.6	41.7	73.6	42.3	73.2	3890	44.4

2003	6438.6	925	81.4	76.9	79.1	73.9	79.5	73.6	7734	88.3
2004	7480.1	925	93.7	77.7	90.9	74.7	92.1	74.5	8312	94.6
2005	3053.4	925	41.7	76.0	37.7	72.9	37.7	72.7	3734	42.6
2006	7623.9	925	93.1	76.8	93.1	73.9	94.1	73.7	8306	94.8
2007	4096.4	925	50.8	75.6	49.7	72.8	50.6	72.7	4878	55.7
2008	6718.8	925	83.7	76.0	83.2	73.2	82.7	73.1	7823	89.1
2009	7668.4	925	94.1	76.7	93.8	74.1	94.6	74.0	8279	94.5
2010	6651.2	925	82.3	76.9	82.0	74.4	82.1	74.3	7626	87.1
2011	7328.2	925	90.3	77.4	89.6	75.0	90.4	74.9	8314	94.9
2012	6802.2	925	86.3	77.7	85.9	75.4	83.7	75.2	7767	88.4
2013	2630.3	925	32.6	76.2	32.6	73.9	32.5	73.7	3045	34.8
2014	7821.2	925	94.6	76.8	94.3	74.6	96.5	74.5	8524	97.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					57	
C. Inspection, maintenance or repair combined with refuelling	237			949		
D. Inspection, maintenance or repair without refuelling				320		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				160		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				293		
J. Grid limitation, failure or grid unavailability						9
L. Human factor related					2	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						12
Z. Other					2	
Subtotal	237	0	0	1722	61	21
Total	237			1804		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		6
15. Reactor Cooling Systems		16
16. Steam generation systems		1
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		3
42. Electrical Power Supply Systems		12
XX. Miscellaneous Systems		3
Total	0	54

## RU-67 SMOLENSK-3

**Operator:** REA (Joint Stock Company 'Concern Rosenergoatom')

**Contractor:** ROSATOM (STATE ATOMIC ENERGY CORPORATION "ROSATOM")

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 925.0 MW(e)  
**Design Net Capacity:** 925.0 MW(e)  
**Design Discharge Burnup:** 22200 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6894.5 GW(e)·h  
**Energy Availability Factor:** 81.7%  
**Load Factor:** 85.1%  
**Operating Factor:** 82.4%  
**Energy Unavailability Factor:** 18.3%  
**Total Off-line Time:** 1542 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	713.0	657.5	725.9	697.3	17.1	0.0	537.1	684.1	691.4	724.6	710.0	736.5	6894.5
<b>EAF (%)</b>	100.0	100.0	100.0	99.5	4.7	0.0	78.8	99.0	100.0	99.6	100.0	100.0	81.7
<b>UCF (%)</b>	100.0	100.0	100.0	99.5	4.7	0.0	78.9	100.0	100.0	99.6	100.0	100.0	81.8
<b>LF (%)</b>	103.6	105.8	105.5	104.7	2.5	0.0	78.0	99.4	103.8	105.1	106.6	107.0	85.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	6.7	0.0	82.8	100.0	100.0	100.0	100.0	100.0	82.4
<b>EUf (%)</b>	0.0	0.0	0.0	0.5	95.3	100.0	21.2	1.0	0.0	0.4	0.0	0.0	18.3
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	93.4	100.0	21.1	0.0	0.0	0.0	0.0	0.0	17.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.5	1.9	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE FEDERAL TARIFFS SERVICE. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - MAY, JULY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 272432 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 2014.05.03 TO 2014.07.09. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES TYPICAL FOR THE EUROPEAN PART OF THE RUSSIAN FEDERATION.

### 5. Historical Summary

**Date of Construction Start:** 01 May 1984  
**Date of First Criticality:** 29 Dec 1989  
**Date of Grid Connection:** 17 Jan 1990  
**Date of Commercial Operation:** 12 Oct 1990

**Lifetime Generation:** 159405.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 79.1%  
**Cumulative Load Factor:** 79.7%  
**Cumulative Unit Capability Factor:** 81.1%  
**Cumulative Energy Unavailability Factor:** 20.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1990	2066.9	925	99.1	99.1	99.1	99.1	101.2	101.2	2208	100.0
1991	6561.7	925	80.9	84.5	80.9	84.5	81.0	85.0	7338	83.8
1992	6866.6	925	83.9	84.3	83.9	84.3	84.5	84.8	7515	85.6
1993	6596.0	925	82.6	83.8	81.4	83.4	81.4	83.8	7419	84.7
1994	5513.7	925	82.3	83.4	72.5	80.8	68.0	80.1	6701	76.5
1995	5091.0	925	78.2	82.4	63.2	77.5	62.8	76.8	5844	66.7
1996	6496.6	925	82.2	82.4	80.8	78.0	80.0	77.3	7268	82.7
1997	5559.3	925	69.3	80.6	69.3	76.8	68.6	76.1	6469	73.8
1998	4575.9	925	68.9	79.2	57.5	74.5	56.5	73.7	6162	70.3
1999	6411.0	925	79.3	79.2	78.2	74.9	79.1	74.3	7063	80.6
2000	6970.5	925	84.7	79.7	84.6	75.8	85.8	75.4	7542	85.9
2001	6951.7	925	87.3	80.4	85.4	76.7	85.8	76.3	7823	89.3
2002	7204.9	925	88.7	81.1	87.7	77.6	88.9	77.4	7831	89.4
2003	7038.2	925	87.1	81.5	86.3	78.2	86.9	78.1	7697	87.9
2004	7085.7	925	87.9	82.0	86.9	78.8	87.2	78.7	7765	88.4
2005	7303.7	925	93.1	82.7	90.4	79.6	90.1	79.5	8192	93.5
2006	4943.0	925	60.7	81.3	60.7	78.4	61.0	78.3	5631	64.3
2007	7566.3	925	93.2	82.0	92.5	79.2	93.4	79.2	8247	94.1

2008	5093.4	925	61.3	80.9	61.2	78.3	62.7	78.3	5396	61.4
2009	6083.0	925	74.3	80.5	74.3	78.0	75.1	78.1	6706	76.6
2010	7738.8	925	93.7	81.2	93.5	78.8	95.5	79.0	8233	94.0
2011	6241.8	925	74.0	80.9	74.0	78.6	77.0	78.9	6579	75.1
2012	5845.2	925	70.6	80.4	70.6	78.2	71.9	78.6	6279	71.5
2013	7942.2	925	95.2	81.0	95.1	79.0	98.0	79.4	8471	96.7
2014	6894.5	925	81.8	81.1	81.7	79.1	85.1	79.7	7219	82.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					68	
C. Inspection, maintenance or repair combined with refuelling	1542			749		
D. Inspection, maintenance or repair without refuelling				316		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				215		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				125		
J. Grid limitation, failure or grid unavailability						1
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						64
Z. Other					21	
Subtotal	1542	0	0	1405	89	65
Total	1542			1559		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		14
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems		5
31. Turbine and auxiliaries		7
35. All other I&C Systems		4
41. Main Generator Systems		2
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems		5
Total	0	64

# SK-13 BOHUNICE-3

Operator: SE,plc (Slovenské elektrárne, a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 471.0 MW(e)  
 Design Net Capacity: 408.0 MW(e)  
 Design Discharge Burnup: 57500 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 3730.2 GW(e)·h  
 Energy Availability Factor: 90.6%  
 Load Factor: 90.4%  
 Operating Factor: 94.0%  
 Energy Unavailability Factor: 9.4%  
 Total Off-line Time: 525 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	342.3	300.6	339.6	327.5	338.6	134.8	280.6	334.8	326.8	338.3	325.8	340.5	3730.2
EAF (%)	97.6	94.9	97.0	96.7	97.1	40.4	80.7	95.7	96.4	96.5	96.3	97.2	90.6
UCF (%)	99.9	100.0	99.4	99.6	100.0	43.5	84.9	100.0	100.0	99.4	99.6	100.0	93.9
LF (%)	97.7	95.0	97.0	96.6	96.6	39.7	80.1	95.5	96.4	96.4	96.1	97.2	90.4
OF (%)	100.0	97.2	100.0	100.0	100.0	43.8	86.4	100.0	100.0	100.0	100.0	100.0	94.0
EUf (%)	2.4	5.1	3.0	3.3	2.9	59.6	19.3	4.3	3.6	3.5	3.7	2.8	9.4
PUf (%)	0.1	0.0	0.6	0.4	0.0	56.5	8.3	0.0	0.0	0.6	0.4	0.0	5.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0	0.0	0.0	0.6
XUF (%)	2.3	5.1	2.4	2.9	2.9	3.1	4.1	4.3	3.6	3.0	3.3	2.8	3.3

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

I.-V.2014 OPERATION AT FULL POWER IN BASE LOAD MODE, 1 EXTERNAL EVENT OCCURED - REACTOR POWER REDUCTION TO IN-HOUSE LOAD LEVEL DUE TO DISTANT PROTECTION SIGNAL ACTUATION ON EXTERNAL LINE NO. V043 (WEATHER CONDITION, STRONG WIND)AND 1 PLANNED COOLING TOWER NO.104 SHUTDOWN FOR WINTER SPRAY RECONSTRUCTION. STEAM EXTRACTION FOR DISTRICT HEATING EXCHANGER. VI.-VII.2014 STRETCH-OUT, ANNUAL MAINTENANCE AND REFUELLING, UNPLANNED EXTENSION OF ANNUAL MAINTENANCE, START-UP OPERATION, SCHEDULED MEASURING AND TESTING AND 1 FAILURE - CONDENSATE PUMPS SHUTDOWN, LIMIT II ACTUATION.. VIII.-XII.2014 SCHEDULED ANCILLARY SERVICES TESTING AND CERTIFICATION, PLANNED COOLING TOWER NO.103 SHUTDOWN FOR WINTER SPRAY RECONSTRUCTION.

## 5. Historical Summary

Date of Construction Start: 01 Dec 1976      Lifetime Generation: 87646.9 GW(e)·h  
 Date of First Criticality: 07 Aug 1984      Cumulative Energy Availability Factor: 80.0%  
 Date of Grid Connection: 20 Aug 1984      Cumulative Load Factor: 78.5%  
 Date of Commercial Operation: 14 Feb 1985      Cumulative Unit Capability Factor: 83.2%  
    Cumulative Energy Unavailability Factor: 20.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	2435.0	408	76.8	76.8	76.8	76.8	74.5	74.5	6322	78.9
1986	2674.1	408	75.4	76.1	75.4	76.1	74.8	74.6	7089	80.9
1987	1997.4	408	55.5	69.0	53.7	68.4	55.9	68.2	5181	59.1
1988	2866.9	408	80.2	71.9	79.9	71.3	80.0	71.2	7329	83.4
1989	2992.3	408	85.0	74.6	84.1	73.9	83.7	73.8	7633	87.1
1990	2829.1	408	80.5	75.6	79.2	74.8	79.2	74.7	7376	84.2
1991	2585.6	408	74.2	75.4	71.9	74.4	72.3	74.3	6717	76.7
1992	3140.7	408	83.9	76.4	82.8	75.5	87.6	76.0	7528	85.7
1993	2973.1	408	86.5	77.6	83.2	76.3	83.2	76.8	7721	88.1
1994	2806.8	405	84.0	78.2	79.1	76.6	79.1	77.1	7423	84.7
1995	2536.7	408	78.1	78.2	70.1	76.0	71.0	76.5	6440	73.5
1996	3045.9	436	85.6	78.9	82.5	76.6	79.5	76.8	7504	85.4
1997	3096.4	440	87.7	79.6	84.0	77.2	80.3	77.1	7711	88.0
1998	2804.6	408	85.3	80.0	81.8	77.5	78.5	77.2	7571	86.4
1999	2468.5	408	76.5	79.8	69.7	77.0	69.1	76.6	6620	75.6
2000	2806.7	408	87.9	80.3	79.8	77.2	78.3	76.7	7776	88.5

2001	2687.0	408	86.6	80.7	76.5	77.1	75.2	76.6	7680	87.7
2002	2690.7	408	87.4	81.0	83.9	77.5	75.3	76.6	7711	88.0
2003	2485.0	408	78.3	80.9	75.5	77.4	69.5	76.2	6908	78.9
2004	2564.5	408	82.0	80.9	79.0	77.5	71.6	76.0	7228	82.3
2005	2587.7	408	79.4	80.9	76.7	77.5	72.4	75.8	7034	80.3
2006	2582.6	408	80.7	80.9	78.4	77.5	72.3	75.6	7106	81.1
2007	2432.6	408	73.8	80.6	71.6	77.2	68.1	75.3	6687	76.3
2008	3038.4	429	86.7	80.8	85.8	77.6	83.7	75.7	7680	87.4
2009	3309.7	442	89.3	81.2	87.2	78.0	87.4	76.2	8176	93.3
2010	3385.9	472	88.0	81.5	84.8	78.3	86.0	76.6	8194	93.5
2011	3586.0	472	89.9	81.8	87.2	78.7	86.7	77.0	7890	90.1
2012	3761.7	472	94.2	82.3	91.3	79.2	90.7	77.6	8295	94.4
2013	3727.0	472	93.7	82.8	90.7	79.6	90.1	78.0	8245	94.1
2014	3730.2	471	93.9	83.2	90.6	80.0	90.4	78.5	8235	94.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		50			83	
C. Inspection, maintenance or repair combined with refuelling	456			1151		
D. Inspection, maintenance or repair without refuelling				110		
J. Grid limitation, failure or grid unavailability						6
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			19			
Subtotal	456	50	19	1261	83	6
Total		525			1350	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		4
14. Safety Systems		0
15. Reactor Cooling Systems		12
16. Steam generation systems	50	28
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		9
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems		21
Total	50	78



# SK-14 BOHUNICE-4

Operator: SE,plc (Slovenské elektrárne, a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 471.0 MW(e)  
 Design Net Capacity: 408.0 MW(e)  
 Design Discharge Burnup: 57500 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 3767.5 GW(e)·h  
 Energy Availability Factor: 91.4%  
 Load Factor: 91.3%  
 Operating Factor: 94.9%  
 Energy Unavailability Factor: 8.6%  
 Total Off-line Time: 446 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	343.8	310.1	339.3	259.0	182.9	328.6	333.5	332.9	326.3	335.6	330.2	345.5	3767.5
EAF (%)	97.5	97.6	97.1	76.7	52.4	97.2	95.6	96.3	96.4	95.7	97.1	98.2	91.4
UCF (%)	100.0	100.0	99.4	83.1	53.9	100.0	100.0	100.0	100.0	99.4	99.6	100.0	94.6
LF (%)	98.1	98.0	97.0	76.4	52.2	96.9	95.2	95.0	96.2	95.6	97.4	98.6	91.3
OF (%)	100.0	100.0	100.0	83.8	55.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.9
EUUF (%)	2.5	2.4	2.9	23.3	47.6	2.8	4.4	3.7	3.6	4.3	2.9	1.8	8.6
PUF (%)	0.0	0.0	0.6	16.9	46.1	0.0	0.0	0.0	0.0	0.6	0.4	0.0	5.4
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	2.5	2.4	2.3	6.4	1.4	2.8	4.4	3.7	3.6	3.7	2.4	1.8	3.1

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

I.-III.2014 OPERATION AT FULL POWER IN BASE LOAD MODE, TG STEAM EXTRACTION FOR DISTRICT HEATING EXCHANGER, PLANNED COOLING TOWER NO.104 SHUTDOWN FOR WINTER SPRAY RECONSTRUCTION.  
 IV.-V.2014 STRETCH-OUT, ANNUAL MAINTENANCE AND REFUELLING, START-UP OPERATION, SCHEDULED MEASURING AND TESTING. VI.-XII.2014 OPERATION AT FULL POWER IN BASE LOAD MODE, STEAM EXTRACTION FOR DISTRICT HEATING EXCHANGER, OKT-NOV PLANNED COOLING TOWER NO.103 SHUTDOWN FOR WINTER SPRAY RECONSTRUCTION. OPERATION WITHOUT ANY FAILURES.

## 5. Historical Summary

Date of Construction Start: 01 Dec 1976      Lifetime Generation: 86539.0 GW(e)·h  
 Date of First Criticality: 02 Aug 1985      Cumulative Energy Availability Factor: 81.4%  
 Date of Grid Connection: 09 Aug 1985      Cumulative Load Factor: 79.8%  
 Date of Commercial Operation: 18 Dec 1985      Cumulative Unit Capability Factor: 84.5%  
    Cumulative Energy Unavailability Factor: 18.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	298.1	408	100.0	100.0	100.0	100.0	98.2	98.2	744	100.0
1986	2887.9	408	81.0	82.5	81.0	82.5	80.8	82.2	7294	83.3
1987	3084.7	408	86.6	84.5	86.1	84.2	86.3	84.2	7783	88.8
1988	2786.5	408	78.0	82.4	77.8	82.1	77.7	82.1	7248	82.5
1989	2827.7	408	80.0	81.8	79.2	81.4	79.1	81.3	7548	86.2
1990	2873.8	408	82.0	81.8	80.7	81.3	80.4	81.2	7427	84.8
1991	2850.5	408	82.9	82.0	80.4	81.1	79.8	80.9	7438	84.9
1992	2711.9	408	73.3	80.8	70.4	79.6	75.7	80.2	6714	76.4
1993	2847.6	408	82.6	81.0	79.7	79.6	79.7	80.1	7341	83.8
1994	2791.4	405	83.9	81.3	78.7	79.5	78.7	80.0	7389	84.3
1995	2823.7	408	88.5	82.0	79.3	79.5	79.0	79.9	7211	82.3
1996	2834.9	436	79.2	81.8	76.1	79.2	74.0	79.3	6953	79.2
1997	2953.5	440	84.7	82.0	80.2	79.3	76.6	79.1	7469	85.3
1998	2822.4	408	85.7	82.3	82.4	79.5	79.0	79.1	7525	85.9
1999	2656.5	408	81.7	82.2	75.1	79.2	74.3	78.7	7283	83.1
2000	2431.9	408	76.3	81.9	68.9	78.5	67.9	78.0	6791	77.3
2001	2793.3	408	86.7	82.2	79.2	78.6	78.2	78.0	7721	88.1

2002	2823.2	408	87.9	82.5	85.0	78.9	79.0	78.1	7742	88.4
2003	2814.9	408	87.8	82.8	84.4	79.2	78.8	78.1	7737	88.3
2004	2390.9	408	77.0	82.5	74.4	79.0	66.7	77.5	6786	77.3
2005	2841.0	408	87.3	82.7	84.3	79.2	79.5	77.6	7671	87.6
2006	2489.3	408	79.3	82.5	77.0	79.1	69.6	77.2	7035	80.3
2007	2648.5	408	79.9	82.4	78.0	79.1	74.1	77.1	7053	80.5
2008	2739.0	410	79.6	82.3	78.8	79.1	76.3	77.1	7254	82.6
2009	3239.6	448	88.9	82.6	86.9	79.4	87.1	77.5	8118	92.7
2010	3513.1	472	90.3	82.9	87.7	79.8	87.6	77.9	8214	93.8
2011	3732.9	472	93.4	83.4	90.8	80.3	90.3	78.5	8225	93.9
2012	3640.4	472	90.1	83.7	87.9	80.6	87.8	78.9	7952	90.5
2013	3788.7	471	94.5	84.1	91.8	81.0	91.8	79.4	8313	94.9
2014	3767.5	471	94.6	84.5	91.4	81.4	91.3	79.8	8314	94.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					41	
C. Inspection, maintenance or repair combined with refuelling	446			1071		
D. Inspection, maintenance or repair without refuelling				49		
E. Testing of plant systems or components				0	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				18		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					0	
Subtotal	446	0	0	1138	41	0
Total		446			1179	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		5
15. Reactor Cooling Systems		0
16. Steam generation systems		24
17. Safety I&C Systems (excluding reactor I&C)		3
32. Feedwater and Main Steam System		4
33. Circulating Water System		0
35. All other I&C Systems		0
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		1
Total	0	38

# SK-6 MOCHOVCE-1

Operator: SE,plc (Slovenské elektrárne, a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 436.0 MW(e)  
 Design Net Capacity: 408.0 MW(e)  
 Design Discharge Burnup: 57200 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 3530.1 GW(e)·h  
 Energy Availability Factor: 92.4%  
 Load Factor: 92.4%  
 Operating Factor: 94.3%  
 Energy Unavailability Factor: 7.6%  
 Total Off-line Time: 501 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	325.8	294.2	294.7	55.9	324.8	314.0	321.8	323.3	313.5	321.7	315.0	325.4	3530.1
EAF (%)	100.0	100.0	91.9	19.6	99.7	99.7	99.2	99.6	99.7	98.4	100.0	99.9	92.4
UCF (%)	100.0	100.0	92.0	19.6	99.8	100.0	100.0	100.0	99.9	98.6	100.0	100.0	92.6
LF (%)	100.4	100.4	91.0	17.8	100.1	100.0	99.2	99.7	99.9	99.0	100.4	100.3	92.4
OF (%)	100.0	100.0	92.2	39.4	100.0	100.0	100.0	100.0	100.0	99.1	100.0	100.0	94.3
EUf (%)	0.0	0.0	8.1	80.4	0.3	0.3	0.8	0.4	0.3	1.6	0.0	0.1	7.6
PUf (%)	0.0	0.0	8.0	75.2	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	6.9
UCLF (%)	0.0	0.0	0.0	5.2	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.5
XUF (%)	0.0	0.0	0.1	0.0	0.1	0.3	0.7	0.4	0.2	0.2	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

MOCHOVCE 1 UNIT WAS OPERATED AT FULL POWER IN A BASE LOAD MODE IN 2014. UNIT PROVIDED GRID SUPPORTING SERVICES FOR LOAD FOLLOWING - FREQUENCY AND SECONDARY POWER CONTROL FOR GRID ADJUSTMENT AND TERTIARY POWER CONTROL. THERE WERE NO AUTOMATIC REACTOR SCRAMS DURING THE YEAR. UNPLANNED OUTAGES, OCCURED IN THE REPORTING PERIOD, CAUSED FORCED LOSSES OF 1.99 EFPD (1.56 OF THEM CAUSED BY EXTENDED GENERAL OVERHAUL). PLANNED ENERGY LOSSES OF 25.18 EFPD INCLUDED GENERAL OVERHAUL WITH REFUELING (19.00 EFPD), TG12 STATOR EXCHANGE (5.78 EFPD) AND THE REST WERE SCHEDULED TESTS AND RECERTIFICATION OF THE SUPPORTING SERVICES. OTHER FACTORS AFFECTING ENERGY GENERATION WERE LIMITATIONS DUE TO COAST-DOWN OPERATION AND ENVIRONMENTAL CONDITIONS (COOLING WATER TEMPERATURE LIMITS).

## 5. Historical Summary

Date of Construction Start: 13 Oct 1983      Lifetime Generation: 50121.8 GW(e)·h  
 Date of First Criticality: 09 Jun 1998      Cumulative Energy Availability Factor: 85.3%  
 Date of Grid Connection: 04 Jul 1998      Cumulative Load Factor: 84.2%  
 Date of Commercial Operation: 29 Oct 1998      Cumulative Unit Capability Factor: 87.3%  
    Cumulative Energy Unavailability Factor: 14.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1998	784.8	408	97.9	97.9	96.7	96.7	87.1	87.1	2189	99.1
1999	2376.1	404	70.4	76.0	65.8	72.1	67.1	71.2	6397	73.0
2000	2816.9	404	90.0	82.2	79.4	75.3	79.4	74.8	8311	94.6
2001	2423.6	404	75.0	80.0	68.1	73.1	68.5	72.9	6648	75.9
2002	2914.8	405	86.3	81.5	83.3	75.5	82.2	75.1	7628	87.1
2003	2796.6	405	83.0	81.8	82.3	76.8	78.8	75.8	7324	83.6
2004	2996.0	405	88.6	82.8	88.1	78.6	84.2	77.1	7801	88.8
2005	2712.6	405	80.8	82.6	80.3	78.9	76.5	77.0	7128	81.4
2006	3059.7	405	90.7	83.5	90.0	80.2	86.2	78.2	7977	91.1
2007	3142.7	405	90.0	84.2	89.2	81.2	88.6	79.3	7954	90.8
2008	3329.4	436	91.0	84.9	90.6	82.1	89.6	80.3	8064	91.8
2009	3111.6	436	82.4	84.7	82.0	82.1	81.5	80.4	7466	85.2
2010	3446.8	436	91.5	85.3	91.0	82.9	90.2	81.3	8074	92.2
2011	3542.9	436	93.3	85.9	92.9	83.7	92.8	82.2	8235	94.0
2012	3532.6	436	92.6	86.4	92.1	84.3	92.2	82.9	8188	93.2

2013	3526.2	436	93.3	86.9	92.3	84.9	92.3	83.6	8195	93.6
2014	3530.1	436	92.6	87.3	92.4	85.3	92.4	84.2	8259	94.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1998 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		44			55	
C. Inspection, maintenance or repair combined with refuelling	456			833		
D. Inspection, maintenance or repair without refuelling				40		
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						1
L. Human factor related					7	
Z. Other					4	
Subtotal	456	44	0	873	66	4
Total		500			943	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1998 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		22
12. Reactor I&C Systems		3
14. Safety Systems		7
15. Reactor Cooling Systems		1
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		2
41. Main Generator Systems	6	1
42. Electrical Power Supply Systems	37	15
Total	43	51

## SK-7 MOCHOVCE-2

Operator: SE,plc (Slovenské elektrárne, a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 436.0 MW(e)  
 Design Net Capacity: 408.0 MW(e)  
 Design Discharge Burnup: 57200 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3392.5 GW(e)·h  
 Energy Availability Factor: 88.4%  
 Load Factor: 88.8%  
 Operating Factor: 89.5%  
 Energy Unavailability Factor: 11.6%  
 Total Off-line Time: 918 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	327.6	294.2	319.6	315.8	324.8	311.5	320.2	321.5	186.8	26.7	316.6	327.2	3392.5
EAF (%)	100.0	100.0	98.5	99.9	99.4	98.6	98.0	98.5	59.7	9.8	99.9	100.0	88.4
UCF (%)	100.0	100.0	98.6	100.0	100.0	99.7	100.0	100.0	63.5	9.8	99.9	100.0	89.2
LF (%)	101.0	100.4	98.7	100.6	100.1	99.2	98.7	99.1	59.5	8.2	100.9	100.9	88.8
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.8	11.8	100.0	100.0	89.5
EUf (%)	0.0	0.0	1.5	0.1	0.6	1.4	2.0	1.5	40.3	90.2	0.1	0.0	11.6
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.5	70.0	0.0	0.0	9.0
UCLF (%)	0.0	0.0	1.4	0.0	0.0	0.3	0.0	0.0	0.0	20.2	0.0	0.0	1.9
XUF (%)	0.0	0.0	0.1	0.1	0.6	1.1	2.0	1.5	3.8	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

MOCHOVCE 2 UNIT WAS LARGELY OPERATED AT FULL POWER IN A BASE LOAD MODE IN 2014. UNIT PROVIDED GRID SUPPORTING SERVICES FOR LOAD FOLLOWING - FREQUENCY AND SECONDARY POWER CONTROL FOR GRID ADJUSTMENT AND TERTIARY POWER CONTROL. THROUGHOUT THE YEAR THERE WERE NO AUTOMATIC REACTOR SCRAMS AND NO UNPLANNED FULL OUTAGES. UNPLANNED POWER REDUCTIONS AND THE EXTENSION OF THE GENERAL OVERHAUL CAUSED FORCED LOSSES OF 6.79 EFPD. PLANNED ENERGY LOSSES OF 32.71 EFPD INCLUDED GENERAL OVERHAUL WITH REFUELING (32.00 EFPD), AND THE REST WERE SCHEDULED TESTS AND SUPPORTING SERVICES RECERTIFICATIONS. OTHER FACTORS AFFECTING ENERGY GENERATION WERE LIMITATIONS DUE COAST-DOWN OPERATION AND ENVIRONMENTAL CONDITIONS (COOLING WATER TEMPERATURE LIMITS).

### 5. Historical Summary

Date of Construction Start: 13 Oct 1983      Lifetime Generation: 45302.2 GW(e)·h  
 Date of First Criticality: 01 Dec 1999      Cumulative Energy Availability Factor: 85.9%  
 Date of Grid Connection: 20 Dec 1999      Cumulative Load Factor: 83.1%  
 Date of Commercial Operation: 11 Apr 2000      Cumulative Unit Capability Factor: 87.4%  
    Cumulative Energy Unavailability Factor: 14.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2000	2222.5	404	91.6	91.6	87.9	87.9	83.3	83.3	5912	89.6
2001	2540.9	404	78.2	83.9	72.1	78.9	71.8	76.8	6967	79.5
2002	2498.4	405	76.0	81.0	71.7	76.3	70.4	74.5	6862	78.3
2003	2964.9	405	87.8	82.9	87.4	79.2	83.6	76.9	7729	88.2
2004	2034.5	405	81.6	82.6	81.4	79.7	57.2	72.7	7210	82.1
2005	3050.9	405	89.5	83.8	88.5	81.2	86.0	75.0	7900	90.2
2006	2787.2	405	82.1	83.5	81.1	81.2	78.6	75.6	7254	82.8
2007	3191.3	405	91.3	84.5	90.8	82.4	90.0	77.4	8082	92.3
2008	3070.5	436	88.3	85.0	87.9	83.1	85.2	78.3	7797	88.8
2009	3414.9	436	91.5	85.7	90.9	83.9	89.4	79.5	8128	92.8
2010	3189.9	436	85.2	85.6	84.4	84.0	83.5	79.9	7574	86.5
2011	3480.3	436	92.5	86.3	91.6	84.6	91.1	80.9	8195	93.6
2012	3476.4	436	92.0	86.7	90.4	85.1	90.8	81.7	8121	92.5
2013	3581.8	436	94.2	87.3	93.3	85.7	93.8	82.7	8274	94.5
2014	3392.5	436	89.2	87.4	88.4	85.9	88.8	83.1	7842	89.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2000 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		150			49	
C. Inspection, maintenance or repair combined with refuelling	768			806		
D. Inspection, maintenance or repair without refuelling				96		
L. Human factor related					2	
Subtotal	768	150	0	902	51	0
Total		918			953	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2000 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems	150	24
16. Steam generation systems		2
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		1
33. Circulating Water System		0
41. Main Generator Systems		4
42. Electrical Power Supply Systems		3
Total	150	45

# SI-1 KRSKO

Operator: NEK (Nuklerana elektrarna Krško)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 688.0 MW(e)

Design Net Capacity: 632.0 MW(e)

Design Discharge Burnup: 44029 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6060.8 GW(e)·h

Energy Availability Factor: 100.0%

Load Factor: 100.6%

Operating Factor: 100.0%

Energy Unavailability Factor: 0.0%

Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	517.1	465.9	517.3	500.0	515.0	493.7	510.8	511.8	497.0	515.4	498.8	518.0	6060.8
EAF (%)	100.0	100.0	100.0	100.0	100.0	99.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	101.0	100.8	101.2	100.9	100.6	99.7	99.8	100.0	100.3	100.6	100.7	101.2	100.6
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

OPERATION WITHOUT ANY SHUTDOWN

## 5. Historical Summary

Date of Construction Start: 30 Mar 1975      Lifetime Generation: 155462.3 GW(e)·h

Date of First Criticality: 11 Sep 1981      Cumulative Energy Availability Factor: 85.1%

Date of Grid Connection: 02 Oct 1981      Cumulative Load Factor: 84.3%

Date of Commercial Operation: 01 Jan 1983      Cumulative Unit Capability Factor: 86.3%

Cumulative Energy Unavailability Factor: 14.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	3724.1	632	69.6	69.6	69.6	69.6	67.3	67.3	6255	71.4
1984	4207.6	632	79.8	74.7	79.8	74.7	75.8	71.5	7073	80.5
1985	3845.3	632	72.1	73.8	72.1	73.8	69.5	70.8	6421	73.3
1986	3822.0	620	74.8	74.1	73.7	73.8	70.4	70.7	6561	74.9
1987	4278.8	620	83.5	76.0	83.5	75.7	78.8	72.3	7287	83.2
1988	3935.8	620	77.0	76.1	76.9	75.9	72.3	72.3	6866	78.2
1989	4453.9	620	85.5	77.4	85.2	77.2	82.0	73.7	7500	85.6
1990	4386.8	620	87.1	78.6	85.4	78.3	80.8	74.6	7592	86.7
1991	4718.2	632	94.6	80.4	88.7	79.4	85.2	75.8	8133	92.8
1992	3767.2	632	74.0	79.8	68.6	78.3	67.9	75.0	6699	76.3
1993	3762.8	620	72.5	79.1	69.3	77.5	69.3	74.4	6493	74.1
1994	4403.5	620	82.1	79.4	81.1	77.8	81.1	75.0	7402	84.5
1995	4568.5	620	85.1	79.8	84.1	78.3	84.1	75.7	7606	86.8
1996	4361.6	620	79.6	79.8	79.6	78.4	80.1	76.0	7143	81.3
1997	4794.0	620	88.3	80.4	87.8	79.0	88.3	76.8	7824	89.3
1998	4793.6	620	89.5	80.9	88.0	79.6	88.3	77.5	7913	90.3
1999	4492.4	620	84.7	81.2	82.4	79.7	82.7	77.8	7480	85.4
2000	4548.8	646	82.6	81.2	80.5	79.8	80.1	78.0	7295	83.0
2001	5036.3	656	88.4	81.6	86.2	80.1	87.6	78.5	7790	88.9
2002	5308.8	676	92.0	82.2	91.1	80.7	89.6	79.1	8111	92.6
2003	4963.3	676	91.6	82.7	86.2	81.0	83.8	79.3	8084	92.3
2004	5212.2	676	91.4	83.1	89.9	81.4	87.8	79.7	8081	92.0
2005	5613.7	656	98.5	83.8	98.3	82.2	97.7	80.6	8664	98.9

2006	5289.5	666	90.1	84.1	89.9	82.5	91.3	81.0	7883	90.0
2007	5428.2	666	91.0	84.4	90.9	82.9	93.0	81.5	7989	91.2
2008	5972.0	666	98.6	84.9	98.6	83.5	102.1	82.3	8660	98.6
2009	5459.7	666	90.8	85.1	90.8	83.8	93.6	82.8	7992	91.2
2010	5380.7	666	89.3	85.3	89.3	84.0	92.2	83.1	7876	89.9
2011	5902.2	688	99.2	85.8	98.6	84.5	97.9	83.7	8600	98.2
2012	5243.7	688	87.0	85.9	86.5	84.6	86.8	83.8	7697	87.6
2013	5036.5	688	83.5	85.8	83.0	84.5	83.6	83.8	7391	84.4
2014	6060.8	688	100.0	86.3	100.0	85.1	100.6	84.3	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					139	
C. Inspection, maintenance or repair combined with refuelling				845		
D. Inspection, maintenance or repair without refuelling				141		
E. Testing of plant systems or components				44	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				20		
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Subtotal	0	0	0	1050	140	3
Total	0			1193		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		17
12. Reactor I&C Systems		3
14. Safety Systems		2
15. Reactor Cooling Systems		13
16. Steam generation systems		12
31. Turbine and auxiliaries		28
32. Feedwater and Main Steam System		39
33. Circulating Water System		3
35. All other I&C Systems		0
41. Main Generator Systems		6
42. Electrical Power Supply Systems		12
Total	0	135



**ZA-1 KOEBERG-1**

Operator: ESKOM (ESKOM)  
 Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Net Reference Unit Power (RUP)  
 at the beginning of 2014: 930.0 MW(e)  
 Design Net Capacity: 921.0 MW(e)  
 Design Discharge Burnup: 46000 MW·d/t  
 Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 8102.9 GW(e)·h  
 Energy Availability Factor: 99.6%  
 Load Factor: 99.5%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.4%  
 Total Off-line Time: 0 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	678.9	625.6	693.1	671.2	690.3	668.6	690.8	689.8	667.8	686.1	652.0	688.6	8102.9
EAF (%)	98.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	97.7	99.8	99.6
UCF (%)	98.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	97.9	99.9	99.6
LF (%)	98.1	100.1	100.2	100.2	99.8	99.9	99.8	99.7	99.7	99.2	97.4	99.5	99.5
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.3	0.2	0.4
PUf (%)	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.1	0.0	0.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

ON LINE FOR THE ENTIRE YEAR

**5. Historical Summary**

Date of Construction Start: 01 Jul 1976      Lifetime Generation: 173155.5 GW(e)·h  
 Date of First Criticality: 14 Mar 1984      Cumulative Energy Availability Factor: 73.0%  
 Date of Grid Connection: 04 Apr 1984      Cumulative Load Factor: 70.8%  
 Date of Commercial Operation: 21 Jul 1984      Cumulative Unit Capability Factor: 76.9%  
    Cumulative Energy Unavailability Factor: 27.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	3441.3	920	90.6	90.6	88.8	88.8	84.7	84.7	4110	93.1
1985	4004.3	920	53.5	65.9	53.5	65.3	49.7	61.4	4986	56.9
1986	3419.0	922	53.6	61.0	53.6	60.6	42.3	53.8	4575	52.2
1987	2864.5	920	61.6	61.2	61.6	60.9	35.5	48.6	4337	49.5
1988	5964.4	920	76.0	64.5	76.0	64.3	73.8	54.2	6791	77.3
1989	4498.1	922	63.2	64.2	63.2	64.1	55.2	54.4	5655	64.0
1990	3852.1	920	61.7	63.9	52.7	62.3	47.8	53.4	5360	61.2
1991	5976.8	920	76.3	65.5	74.6	64.0	74.2	56.1	6886	78.6
1992	3992.5	920	63.6	65.3	50.3	62.4	49.4	55.3	5697	64.9
1993	4097.9	920	66.4	65.4	50.5	61.1	50.8	54.9	6010	68.6
1994	5933.9	920	95.6	68.3	74.9	62.4	73.6	56.7	8422	96.1
1995	4576.9	920	65.7	68.1	56.8	61.9	56.7	56.7	5853	66.8
1996	5672.8	920	81.8	69.2	70.4	62.6	70.2	57.7	7260	82.7
1997	6610.7	920	87.4	70.5	82.3	64.1	82.0	59.5	7676	87.6
1998	7248.3	920	97.6	72.4	90.1	65.9	89.9	61.6	8552	97.6
1999	7051.7	920	88.1	73.4	83.3	67.0	87.5	63.3	7848	89.6
2000	5629.2	920	73.4	73.4	70.2	67.2	69.8	63.7	7250	82.7
2001	6042.5	920	83.0	73.9	77.1	67.7	75.0	64.3	7303	83.4
2002	7328.6	900	95.2	75.1	93.1	69.1	93.0	65.9	8417	96.1
2003	6413.4	900	84.1	75.5	81.9	69.7	81.3	66.6	7398	84.5
2004	6388.0	900	81.6	75.8	81.1	70.3	80.8	67.3	7358	83.8
2005	5821.0	900	76.8	75.8	74.7	70.5	73.8	67.6	6726	76.8
2006	4682.8	900	61.0	75.2	59.8	70.0	59.4	67.2	5435	62.0

2007	5747.0	900	74.4	75.2	73.6	70.2	72.9	67.5	6609	75.4
2008	7691.9	900	98.3	76.1	98.3	71.3	97.3	68.7	8689	98.9
2009	5468.0	900	71.1	75.9	70.1	71.2	69.4	68.7	6307	72.0
2010	5291.7	900	68.4	75.6	67.8	71.1	67.1	68.7	6085	69.5
2011	7622.4	930	94.3	76.3	94.3	72.0	94.1	69.6	8315	94.9
2012	6384.8	930	78.6	76.4	78.5	72.2	78.2	69.9	6975	79.4
2013	5527.6	930	68.1	76.1	68.1	72.1	67.9	69.8	6084	69.5
2014	8102.9	930	99.6	76.9	99.6	73.0	99.5	70.8	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					379	
C. Inspection, maintenance or repair combined with refuelling				1158	14	
D. Inspection, maintenance or repair without refuelling				158		
E. Testing of plant systems or components				3	12	
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					9	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				52		
Z. Other					44	
Subtotal	0	0	0	1371	458	0
Total	0			1829		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		23
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		0
14. Safety Systems		2
15. Reactor Cooling Systems		86
16. Steam generation systems		0
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		56
32. Feedwater and Main Steam System		21
33. Circulating Water System		3
41. Main Generator Systems		132
42. Electrical Power Supply Systems		44
Total	0	373

## ZA-2 KOEBERG-2

Operator: ESKOM (ESKOM)  
Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
Net Reference Unit Power (RUP) at the beginning of 2014: 930.0 MW(e)  
Design Net Capacity: 921.0 MW(e)  
Design Discharge Burnup: 46000 MW·d/t  
Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6659.8 GW(e)·h  
Energy Availability Factor: 82.0%  
Load Factor: 81.7%  
Operating Factor: 85.2%  
Energy Unavailability Factor: 18.0%  
Total Off-line Time: 1298 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	686.9	564.1	376.3	0.0	274.0	668.3	688.6	689.4	667.4	690.5	666.0	688.3	6659.8
EAF (%)	99.7	90.3	55.0	0.0	39.6	100.0	99.7	100.0	100.0	100.0	99.8	99.8	82.0
UCF (%)	100.0	100.0	74.7	0.0	39.6	100.0	99.7	100.0	100.0	100.0	100.0	99.9	84.5
LF (%)	99.3	90.3	54.4	0.0	39.6	99.8	99.5	99.6	99.7	99.8	99.5	99.5	81.7
OF (%)	100.0	100.0	74.7	0.0	47.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.2
EUf (%)	0.3	9.7	45.0	100.0	60.4	0.0	0.3	0.0	0.0	0.0	0.2	0.2	18.0
PUf (%)	0.0	0.0	25.3	100.0	23.8	0.0	0.0	0.0	0.0	0.0	0.0	0.1	12.4
UCLF (%)	0.0	0.0	0.0	0.0	36.6	0.0	0.3	0.0	0.0	0.0	0.0	0.0	3.1
XUF (%)	0.3	9.7	19.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	2.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Jul 1976      Lifetime Generation: 167304.9 GW(e)·h  
Date of First Criticality: 07 Jul 1985      Cumulative Energy Availability Factor: 72.5%  
Date of Grid Connection: 25 Jul 1985      Cumulative Load Factor: 71.3%  
Date of Commercial Operation: 09 Nov 1985      Cumulative Unit Capability Factor: 78.4%  
Cumulative Energy Unavailability Factor: 27.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	483.7	920	37.2	37.2	37.2	37.2	35.9	35.9	555	37.9
1986	5409.0	922	67.4	63.1	67.3	63.0	67.0	62.5	5969	68.1
1987	3352.8	920	48.6	56.4	48.6	56.4	41.6	52.9	4193	47.9
1988	4552.7	920	63.1	58.5	63.1	58.5	56.3	54.0	5626	64.0
1989	6620.2	922	89.2	65.9	89.2	65.9	81.3	60.6	8115	91.9
1990	4614.3	920	64.8	65.7	58.4	64.5	57.3	59.9	5933	67.7
1991	3191.9	920	56.3	64.2	40.3	60.6	39.6	56.6	5067	57.8
1992	5308.1	920	94.9	68.5	66.3	61.4	65.7	57.9	8439	96.1
1993	3212.3	920	52.6	66.5	40.4	58.8	39.9	55.7	4654	53.1
1994	3755.9	920	69.2	66.8	49.5	57.8	46.6	54.7	5944	67.9
1995	6710.5	920	98.6	69.9	83.2	60.3	83.3	57.5	8640	98.6
1996	6084.9	920	81.5	71.0	75.8	61.7	75.3	59.1	7177	81.7
1997	6016.4	920	83.8	72.0	75.2	62.8	74.7	60.4	7409	84.6
1998	6333.0	920	81.3	72.7	79.0	64.0	78.6	61.8	7194	82.1
1999	6413.9	920	86.2	73.7	75.7	64.8	79.6	63.0	7509	85.7
2000	7365.9	920	98.1	75.3	91.2	66.6	91.1	64.9	8687	98.9
2001	4662.8	920	66.5	74.8	60.1	66.2	57.9	64.4	5461	62.3
2002	4688.8	900	60.6	73.9	59.6	65.8	59.5	64.2	5439	62.1
2003	6255.5	900	82.9	74.4	79.4	66.5	79.3	65.0	7150	81.6
2004	7896.7	900	99.8	75.7	99.8	68.2	99.9	66.8	8784	100.0
2005	6416.8	900	84.2	76.1	81.5	68.9	81.4	67.5	7330	83.7
2006	5391.4	900	81.3	76.4	71.4	69.0	68.4	67.5	7003	79.9
2007	6853.9	900	95.3	77.2	87.3	69.8	86.9	68.4	8422	96.1
2008	5055.9	900	66.2	76.7	64.2	69.6	64.0	68.2	5960	67.9

2009	6105.8	900	79.4	76.9	77.9	69.9	77.4	68.6	7079	80.8
2010	7608.2	900	98.1	77.7	98.0	71.0	96.5	69.7	8565	97.8
2011	5316.2	900	70.1	77.4	68.0	70.9	67.4	69.6	6254	71.4
2012	6012.7	930	76.4	77.4	76.3	71.1	75.8	69.8	6911	78.7
2013	8113.0	930	99.8	78.2	99.8	72.1	99.6	70.9	8760	100.0
2014	6659.8	930	84.5	78.4	82.0	72.5	81.7	71.3	7462	85.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		266			451	
C. Inspection, maintenance or repair combined with refuelling	1032			1075	32	
D. Inspection, maintenance or repair without refuelling				47		
E. Testing of plant systems or components				44	0	
H. Nuclear regulatory requirements					1	
J. Grid limitation, failure or grid unavailability						29
L. Human factor related					11	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						0
Z. Other					42	3
Subtotal	1032	266	0	1166	537	32
Total		1298			1735	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	266	
12. Reactor I&C Systems		10
14. Safety Systems		60
15. Reactor Cooling Systems		14
16. Steam generation systems		47
31. Turbine and auxiliaries		24
32. Feedwater and Main Steam System		18
33. Circulating Water System		3
35. All other I&C Systems		1
41. Main Generator Systems		70
42. Electrical Power Supply Systems		155
XX. Miscellaneous Systems		43
Total	266	445

## ES-6 ALMARAZ-1

**Operator:** CNAT (CENTRALES NUCLEARES ALMARAZ-TRILLO(ID/UFG/ENDESA/HC/NUCLENOR ))

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 1011.0 MW(e)  
**Design Net Capacity:** 900.0 MW(e)  
**Design Discharge Burnup:** 58000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7252.5 GW(e)·h  
**Energy Availability Factor:** 81.9%  
**Load Factor:** 81.9%  
**Operating Factor:** 83.9%  
**Energy Unavailability Factor:** 18.1%  
**Total Off-line Time:** 1409 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	753.6	680.2	751.2	724.1	745.8	519.1	0.0	209.8	675.6	734.9	718.6	739.6	7252.5
<b>EAF (%)</b>	100.0	100.0	100.0	99.5	99.2	71.3	0.0	27.9	92.8	97.6	98.7	98.3	81.9
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	72.9	0.0	28.1	95.3	100.0	99.8	99.1	82.7
<b>LF (%)</b>	100.2	100.1	100.0	99.5	99.2	71.3	0.0	27.9	92.8	97.6	98.7	98.3	81.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	73.3	0.0	38.6	97.8	100.0	100.0	100.0	83.9
<b>EUf (%)</b>	0.0	0.0	0.0	0.5	0.8	28.7	100.0	72.1	7.2	2.4	1.3	1.7	18.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	27.1	100.0	71.9	0.0	0.0	0.0	0.0	16.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0	0.2	0.9	0.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.5	0.8	1.6	0.0	0.2	2.5	2.4	1.1	0.8	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

FROM JUNE 23 TO AUGUST 20 TWENTY-THIRD REFUELING AND MAINTENANCE.

### 5. Historical Summary

**Date of Construction Start:** 03 Jul 1973 **Lifetime Generation:** 224452.0 GW(e)·h  
**Date of First Criticality:** 05 Apr 1981 **Cumulative Energy Availability Factor:** 85.4%  
**Date of Grid Connection:** 01 May 1981 **Cumulative Load Factor:** 85.5%  
**Date of Commercial Operation:** 01 Sep 1983 **Cumulative Unit Capability Factor:** 86.4%  
**Cumulative Energy Unavailability Factor:** 14.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	2135.5	930	78.4	78.4	78.4	78.4	78.4	78.4	2597	88.7
1984	4820.5	893	65.0	68.5	65.0	68.5	61.5	65.8	6062	69.0
1985	4825.2	900	61.6	65.6	61.6	65.6	61.2	63.8	5705	65.1
1986	5425.0	900	69.3	66.7	69.3	66.7	68.8	65.3	6418	73.3
1987	7193.7	900	92.5	72.6	92.5	72.6	91.2	71.3	8346	95.3
1988	5879.6	900	74.6	73.0	74.6	73.0	74.4	71.9	6899	78.5
1989	6562.2	895	83.2	74.6	83.2	74.6	83.7	73.7	7640	87.2
1990	6460.7	895	82.2	75.6	82.2	75.6	82.4	74.9	7451	85.1
1991	7481.7	895	96.2	78.1	96.2	78.1	95.4	77.4	8589	98.0
1992	6379.1	895	80.8	78.4	80.8	78.4	81.1	77.8	7387	84.1
1993	6530.9	895	85.1	79.0	83.2	78.8	83.3	78.3	7663	87.5
1994	7448.6	895	95.9	80.5	95.1	80.3	95.0	79.8	8495	97.0
1995	6588.5	895	86.2	81.0	83.7	80.5	84.0	80.1	7709	88.0
1996	5904.3	895	73.8	80.4	72.5	79.9	75.1	79.7	6789	77.3
1997	6642.8	895	83.0	80.6	79.6	79.9	84.7	80.1	7371	84.1
1998	8032.5	944	98.8	81.8	97.1	81.1	97.1	81.2	8760	100.0
1999	6988.6	927	85.4	82.1	84.7	81.3	86.1	81.6	7613	86.9
2000	7471.6	927	91.1	82.6	90.3	81.9	91.8	82.2	8014	91.2
2001	8151.4	927	99.6	83.6	99.0	82.8	100.4	83.2	8749	99.9
2002	7428.0	944	92.2	84.0	90.4	83.2	89.8	83.5	8100	92.5
2003	7499.1	944	93.8	84.5	91.6	83.6	90.7	83.9	8233	94.0
2004	8185.7	944	99.9	85.3	99.2	84.4	98.7	84.6	8784	100.0
2005	7519.4	944	93.1	85.6	91.4	84.7	90.9	84.9	8180	93.4

2006	7152.4	944	88.1	85.7	86.5	84.8	86.5	85.0	7831	89.4
2007	8189.8	944	99.9	86.3	99.0	85.4	99.0	85.6	8760	100.0
2008	7190.8	944	87.2	86.4	86.6	85.5	86.7	85.6	7725	87.9
2009	6880.1	944	83.7	86.3	82.9	85.4	83.2	85.5	7336	83.7
2010	7884.3	1008	90.5	86.4	89.7	85.5	89.7	85.7	8147	93.0
2011	7519.5	1011	86.8	86.4	84.9	85.5	84.9	85.7	7814	89.2
2012	7346.1	1004	85.9	86.4	85.0	85.5	83.3	85.6	7405	84.3
2013	7695.8	1011	88.3	86.5	87.1	85.5	86.9	85.6	7882	90.0
2014	7252.5	1011	82.7	86.4	81.9	85.4	81.9	85.5	7351	83.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		16			135	
C. Inspection, maintenance or repair combined with refuelling	1393			741		
D. Inspection, maintenance or repair without refuelling				175		
E. Testing of plant systems or components				51	0	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					3	
Z. Other					0	
Subtotal	1393	16	0	967	138	4
Total		1409			1109	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	16	13
13. Reactor Auxiliary Systems		33
15. Reactor Cooling Systems		10
16. Steam generation systems		5
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		20
33. Circulating Water System		0
41. Main Generator Systems		25
42. Electrical Power Supply Systems		20
Total	16	130

## ES-7 ALMARAZ-2

**Operator:** CNAT (CENTRALES NUCLEARES ALMARAZ-TRILLO(ID/UFG/ENDESA/HC/NUCLENOR ))

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1006.0 MW(e)  
**Design Net Capacity:** 930.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7949.0 GW(e)·h  
**Energy Availability Factor:** 90.2%  
**Load Factor:** 90.2%  
**Operating Factor:** 91.9%  
**Energy Unavailability Factor:** 9.8%  
**Total Off-line Time:** 706 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	34.3	616.8	749.5	721.5	741.9	705.2	744.7	735.2	701.9	735.4	716.2	746.3	7949.0
<b>EAF (%)</b>	4.6	91.2	100.0	99.6	99.1	97.4	99.5	98.2	96.9	98.1	98.9	99.7	90.2
<b>UCF (%)</b>	4.6	91.2	100.0	100.0	100.0	98.5	100.0	100.0	100.0	100.0	99.5	100.0	91.1
<b>LF (%)</b>	4.6	91.2	100.3	99.6	99.1	97.4	99.5	98.2	96.9	98.1	98.9	99.7	90.2
<b>OF (%)</b>	10.5	94.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.9
<b>EUf (%)</b>	95.4	8.8	0.0	0.4	0.9	2.6	0.5	1.8	3.1	1.9	1.1	0.3	9.8
<b>PUf (%)</b>	85.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3
<b>UCLF (%)</b>	9.6	8.8	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.5	0.0	1.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.4	0.9	1.1	0.5	1.8	3.1	1.9	0.6	0.3	0.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ON JANUARY 25 HE FINISHED TWENTY-FIRST REFUELING.

### 5. Historical Summary

**Date of Construction Start:** 03 Jul 1973  
**Date of First Criticality:** 19 Sep 1983  
**Date of Grid Connection:** 08 Oct 1983  
**Date of Commercial Operation:** 01 Jul 1984

**Lifetime Generation:** 221136.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 87.0%  
**Cumulative Load Factor:** 87.2%  
**Cumulative Unit Capability Factor:** 88.1%  
**Cumulative Energy Unavailability Factor:** 13.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	3204.9	893	86.0	86.0	86.0	86.0	81.3	81.3	3989	90.3
1985	6236.1	900	79.8	81.9	79.8	81.9	79.1	79.8	7297	83.3
1986	5825.2	900	75.2	79.2	75.2	79.2	73.9	77.4	7136	81.5
1987	6402.5	900	81.8	80.0	81.8	80.0	81.2	78.5	7351	83.9
1988	6809.4	900	86.3	81.4	86.3	81.4	86.1	80.2	7838	89.2
1989	6545.7	895	82.8	81.6	82.8	81.6	83.5	80.8	7638	87.2
1990	7649.3	895	97.4	84.0	97.4	84.0	97.6	83.4	8652	98.8
1991	6812.9	895	85.4	84.2	85.4	84.2	86.9	83.8	7712	88.0
1992	6892.7	895	87.3	84.6	87.3	84.6	87.7	84.3	7997	91.0
1993	7710.1	895	99.0	86.1	98.5	86.0	98.3	85.8	8760	100.0
1994	6384.6	895	84.2	85.9	80.9	85.6	81.4	85.4	7562	86.3
1995	6814.7	895	89.1	86.2	86.2	85.6	86.9	85.5	7952	90.8
1996	7273.3	895	91.6	86.6	91.5	86.1	92.5	86.1	8108	92.3
1997	6042.5	895	76.6	85.9	72.6	85.1	77.1	85.4	6811	77.8
1998	5892.4	953	75.9	85.2	70.2	84.0	70.6	84.3	6810	77.7
1999	8126.6	936	98.0	86.0	97.4	84.9	99.1	85.3	8743	99.8
2000	7401.8	936	90.6	86.3	88.5	85.1	90.0	85.6	8160	92.9
2001	7601.5	936	92.1	86.6	91.3	85.5	92.7	86.0	8189	93.5
2002	8154.9	953	98.8	87.3	98.1	86.2	97.7	86.7	8760	100.0
2003	6627.9	953	81.9	87.0	79.9	85.9	79.4	86.3	7391	84.4
2004	7563.2	953	91.6	87.3	90.9	86.1	90.3	86.5	8083	92.0
2005	8253.3	956	100.0	87.9	99.2	86.8	98.6	87.1	8760	100.0
2006	7250.1	956	87.7	87.9	86.8	86.8	86.6	87.1	7747	88.4

2007	7191.7	956	87.1	87.9	86.0	86.7	85.9	87.0	7668	87.5
2008	8331.7	956	100.0	88.4	99.2	87.3	99.2	87.5	8784	100.0
2009	6864.6	956	82.9	88.1	82.0	87.0	82.0	87.3	7367	84.1
2010	7007.0	956	85.5	88.0	83.8	86.9	83.7	87.2	7572	86.4
2011	7737.3	1006	88.6	88.1	88.1	87.0	88.2	87.2	7991	91.2
2012	7698.8	1006	88.2	88.1	87.6	87.0	87.1	87.2	7730	88.0
2013	7412.9	1006	85.9	88.0	84.0	86.9	84.1	87.1	7557	86.3
2014	7949.0	1006	91.1	88.1	90.2	87.0	90.2	87.2	8054	91.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		108			136	
C. Inspection, maintenance or repair combined with refuelling	598			656	6	
D. Inspection, maintenance or repair without refuelling				19		
E. Testing of plant systems or components				26		
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					7	
Z. Other					9	
Subtotal	598	108	0	701	158	1
Total		706			860	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		3
14. Safety Systems		1
15. Reactor Cooling Systems		14
16. Steam generation systems		19
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		19
35. All other I&C Systems		0
41. Main Generator Systems	108	13
42. Electrical Power Supply Systems		27
Total	108	132



## ES-8 ASCO-1

**Operator:** ANAV (ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID))

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 995.0 MW(e)  
**Design Net Capacity:** 888.0 MW(e)  
**Design Discharge Burnup:** 50500 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7096.4 GW(e)·h  
**Energy Availability Factor:** 81.0%  
**Load Factor:** 81.4%  
**Operating Factor:** 82.5%  
**Energy Unavailability Factor:** 19.0%  
**Total Off-line Time:** 1534 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	745.8	675.5	745.7	692.8	31.6	0.0	564.9	729.5	704.7	739.1	718.1	748.7	7096.4
<b>EAF (%)</b>	99.9	99.9	99.9	96.7	4.3	0.0	76.3	98.5	98.4	99.7	99.2	99.9	81.0
<b>UCF (%)</b>	99.9	99.9	99.9	99.9	5.3	0.0	77.3	99.9	99.8	99.7	99.9	99.9	81.7
<b>LF (%)</b>	100.7	101.0	100.9	96.7	4.3	0.0	76.3	98.5	98.4	99.7	100.2	101.1	81.4
<b>OF (%)</b>	100.0	100.0	100.0	100.0	6.5	0.0	84.1	100.0	100.0	100.0	100.0	100.0	82.5
<b>EUf (%)</b>	0.1	0.1	0.1	3.3	95.7	100.0	23.7	1.5	1.6	0.3	0.8	0.1	19.0
<b>PUf (%)</b>	0.1	0.1	0.1	0.1	94.7	61.8	6.9	0.1	0.2	0.3	0.1	0.1	13.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	38.2	15.8	0.0	0.0	0.0	0.0	0.0	4.5
<b>XUF (%)</b>	0.0	0.0	0.0	3.2	1.0	0.0	1.0	1.3	1.4	0.0	0.7	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 16 May 1974  
**Date of First Criticality:** 16 Jun 1983  
**Date of Grid Connection:** 13 Aug 1983  
**Date of Commercial Operation:** 10 Dec 1984

**Lifetime Generation:** 215444.2 GW(e)·h  
**Cumulative Energy Availability Factor:** 84.7%  
**Cumulative Load Factor:** 83.9%  
**Cumulative Unit Capability Factor:** 85.3%  
**Cumulative Energy Unavailability Factor:** 15.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	104.0	887	20.0	20.0	20.0	20.0	15.8	15.8	161	21.6
1985	4429.4	898	60.3	57.2	60.3	57.2	56.3	53.2	5342	61.0
1986	5129.0	898	68.2	62.5	68.2	62.5	65.2	58.9	6208	70.9
1987	6392.0	898	84.3	69.5	83.7	69.3	81.3	66.2	7569	86.4
1988	6669.0	898	84.1	73.1	84.1	73.0	84.5	70.7	7599	86.5
1989	6750.0	930	86.1	75.7	86.0	75.6	82.9	73.1	7771	88.7
1990	6642.0	930	84.5	77.2	84.5	77.1	81.5	74.6	7699	87.9
1991	6836.0	930	87.2	78.6	87.0	78.5	83.9	75.9	7810	89.2
1992	6875.0	887	86.5	79.6	86.5	79.5	88.2	77.4	7898	89.9
1993	6599.0	930	83.3	80.0	83.2	79.9	81.0	77.8	7401	84.5
1994	6868.0	930	87.1	80.7	86.8	80.6	84.3	78.5	7758	88.6
1995	5708.0	900	70.7	79.8	70.4	79.7	72.4	77.9	6387	72.9
1996	7972.0	947	99.0	81.5	99.0	81.4	95.8	79.5	8755	99.7
1997	6411.0	915	80.5	81.4	77.6	81.1	80.0	79.5	7198	82.2
1998	7349.0	949	89.3	82.0	89.1	81.7	88.4	80.2	7943	90.7
1999	8147.0	945	99.0	83.2	98.7	82.8	98.4	81.4	8741	99.8
2000	7681.0	979	89.8	83.6	89.5	83.3	89.3	81.9	8008	91.2
2001	7798.0	991	90.3	84.0	89.8	83.7	89.8	82.4	8056	92.0
2002	8397.0	998	98.2	84.9	97.6	84.5	96.0	83.2	8737	99.7
2003	7581.1	996	88.0	85.0	87.3	84.7	86.9	83.4	7900	90.2
2004	7734.3	995	89.2	85.3	88.6	84.9	88.5	83.7	7949	90.5
2005	7640.5	995	89.0	85.4	88.2	85.0	87.7	83.9	8548	97.6
2006	7418.4	995	87.1	85.5	85.4	85.1	85.1	83.9	7971	91.0
2007	7574.8	995	88.6	85.7	87.4	85.2	86.9	84.1	7876	89.9

2008	7436.3	995	86.3	85.7	85.2	85.2	85.1	84.1	7768	88.4
2009	5499.8	995	64.4	84.8	63.1	84.2	63.1	83.2	5758	65.7
2010	7996.1	995	93.3	85.1	91.7	84.5	91.7	83.6	8231	94.0
2011	6674.5	995	77.5	84.8	76.6	84.2	76.6	83.3	6946	79.3
2012	7388.2	995	86.0	84.9	84.5	84.2	84.5	83.4	7666	87.3
2013	8687.4	995	99.9	85.4	99.3	84.8	99.7	83.9	8760	100.0
2014	7096.4	995	81.7	85.3	81.0	84.7	81.4	83.9	7226	82.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		392			258	
C. Inspection, maintenance or repair combined with refuelling	1141			751	39	
D. Inspection, maintenance or repair without refuelling				30		
E. Testing of plant systems or components				52	4	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						5
Z. Other					7	
Subtotal	1141	392	0	833	312	10
Total		1533			1155	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		9
16. Steam generation systems		8
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		59
32. Feedwater and Main Steam System		10
35. All other I&C Systems		1
41. Main Generator Systems	392	75
42. Electrical Power Supply Systems		79
XX. Miscellaneous Systems		2
Total	392	252

## ES-9 ASCO-2

**Operator:** ANAV (ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID))

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 997.0 MW(e)  
**Design Net Capacity:** 888.0 MW(e)  
**Design Discharge Burnup:** 50500 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6837.4 GW(e)·h  
**Energy Availability Factor:** 78.0%  
**Load Factor:** 78.3%  
**Operating Factor:** 80.0%  
**Energy Unavailability Factor:** 22.0%  
**Total Off-line Time:** 1750 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	745.0	674.7	745.8	721.4	742.8	713.8	717.8	290.5	530.9	726.2	0.0	228.3	6837.4
<b>EAF (%)</b>	99.9	99.9	99.9	99.9	99.9	99.4	96.8	39.2	74.0	97.8	0.0	30.8	78.0
<b>UCF (%)</b>	99.9	99.9	99.9	99.9	99.9	99.4	98.3	40.5	75.1	97.8	0.0	30.8	78.4
<b>LF (%)</b>	100.4	100.7	100.7	100.5	100.1	99.4	96.8	39.2	74.0	97.8	0.0	30.8	78.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	42.1	78.9	100.0	0.0	39.9	80.0
<b>EUf (%)</b>	0.1	0.1	0.1	0.1	0.1	0.6	3.2	60.8	26.0	2.2	100.0	69.2	22.0
<b>PUf (%)</b>	0.1	0.1	0.1	0.1	0.1	0.6	1.8	0.6	0.1	2.2	100.0	52.8	13.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.9	24.8	0.0	0.0	16.4	8.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.4	1.1	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 07 Mar 1975 **Lifetime Generation:** 208595.4 GW(e)·h  
**Date of First Criticality:** 11 Sep 1985 **Cumulative Energy Availability Factor:** 86.7%  
**Date of Grid Connection:** 23 Oct 1985 **Cumulative Load Factor:** 85.7%  
**Date of Commercial Operation:** 31 Mar 1986 **Cumulative Unit Capability Factor:** 87.7%  
**Cumulative Energy Unavailability Factor:** 13.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	4977.0	898	79.3	79.3	79.3	79.3	75.5	75.5	5907	80.4
1987	5954.0	898	78.1	78.7	77.3	78.2	75.7	75.6	7035	80.3
1988	6865.0	898	88.2	82.0	86.8	81.2	87.0	79.6	7874	89.6
1989	6732.0	930	86.3	83.2	85.7	82.4	82.6	80.4	7729	88.2
1990	6933.0	930	90.4	84.7	90.4	84.1	85.1	81.4	7916	90.4
1991	6820.0	930	86.7	85.1	86.5	84.5	83.7	81.8	7799	89.0
1992	7077.0	953	89.9	85.8	89.9	85.3	84.5	82.2	8042	91.6
1993	7052.0	930	90.0	86.3	88.6	85.8	86.6	82.8	7897	90.1
1994	7085.0	930	89.8	86.7	89.5	86.2	87.0	83.3	7962	90.9
1995	6977.0	900	86.4	86.7	86.3	86.2	88.5	83.8	7674	87.6
1996	6011.0	963	75.6	85.6	75.1	85.1	71.1	82.6	6825	77.7
1997	7916.0	900	98.2	86.7	96.2	86.0	100.4	84.0	8725	99.6
1998	7399.0	946	90.6	87.0	89.9	86.3	89.3	84.4	8050	91.9
1999	7215.0	946	87.2	87.0	86.4	86.3	87.1	84.6	7854	89.7
2000	8451.0	983	98.6	87.8	98.6	87.2	97.9	85.6	8734	99.4
2001	7829.0	983	91.0	88.0	90.6	87.4	90.9	85.9	8102	92.5
2002	7780.0	997	90.8	88.2	89.4	87.6	89.1	86.1	8127	92.8
2003	8521.2	997	99.6	88.9	98.7	88.2	97.6	86.8	8738	99.7
2004	6909.3	997	80.2	88.4	79.6	87.7	78.9	86.4	7287	83.0
2005	7418.9	997	86.8	88.3	86.1	87.7	84.9	86.3	7779	88.8
2006	7968.7	997	94.3	88.6	92.4	87.9	91.2	86.5	8335	95.1
2007	7091.4	997	83.6	88.4	81.9	87.6	81.2	86.3	7532	86.0
2008	7123.6	997	83.3	88.1	82.0	87.4	81.3	86.1	7413	84.4
2009	7818.3	997	91.3	88.3	89.5	87.5	89.5	86.2	8082	92.3

2010	7309.1	997	85.6	88.2	83.7	87.3	83.7	86.1	7583	86.6
2011	7142.2	997	84.2	88.0	81.8	87.1	81.8	85.9	7560	86.3
2012	7831.5	997	92.8	88.2	89.4	87.2	89.4	86.1	8327	94.8
2013	7274.2	997	84.3	88.0	83.3	87.0	83.3	86.0	7499	85.6
2014	6837.4	997	78.4	87.7	78.0	86.7	78.3	85.7	7010	80.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		661			179	
C. Inspection, maintenance or repair combined with refuelling	1045			617	47	
D. Inspection, maintenance or repair without refuelling				33		
E. Testing of plant systems or components				17	3	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				16		
J. Grid limitation, failure or grid unavailability						5
L. Human factor related		44			1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				8		
Z. Other				3	8	
Subtotal	1045	705	0	694	238	7
Total		1750			939	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems	583	2
15. Reactor Cooling Systems		8
16. Steam generation systems		12
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		64
33. Circulating Water System		4
41. Main Generator Systems	77	5
42. Electrical Power Supply Systems		52
XX. Miscellaneous Systems		6
Total	660	172

# ES-10 COFRENTES

Operator: ID (IBERDROLA, S.A.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1064.0 MW(e)  
 Design Net Capacity: 939.0 MW(e)  
 Design Discharge Burnup: 40000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9114.8 GW(e)·h  
 Energy Availability Factor: 97.9%  
 Load Factor: 97.8%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 2.1%  
 Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	781.0	715.0	790.5	744.2	790.6	718.2	786.2	772.6	761.9	769.2	765.7	719.7	9114.8
EAF (%)	98.7	100.0	100.0	98.8	99.9	93.8	99.3	97.6	99.5	97.0	100.0	90.9	97.9
UCF (%)	98.7	100.0	100.0	99.1	100.0	94.0	99.9	98.2	100.0	97.2	100.0	90.9	98.1
LF (%)	98.7	100.0	100.0	97.1	99.9	93.7	99.3	97.6	99.5	97.0	99.9	90.9	97.8
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	1.3	0.0	0.0	1.2	0.1	6.2	0.7	2.4	0.5	3.0	0.0	9.1	2.1
PUf (%)	1.3	0.0	0.0	0.9	0.0	1.2	0.1	1.8	0.1	2.8	0.0	2.6	0.9
UCLF (%)	0.1	0.0	0.0	0.0	0.0	4.9	0.0	0.0	0.0	0.0	0.0	6.5	1.0
XUF (%)	0.0	0.0	0.0	0.3	0.1	0.2	0.5	0.6	0.5	0.2	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 09 Sep 1975      Lifetime Generation: 229180.1 GW(e)·h  
 Date of First Criticality: 23 Aug 1984      Cumulative Energy Availability Factor: 87.1%  
 Date of Grid Connection: 14 Oct 1984      Cumulative Load Factor: 87.1%  
 Date of Commercial Operation: 11 Mar 1985      Cumulative Unit Capability Factor: 88.0%  
    Cumulative Energy Unavailability Factor: 12.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	5612.3	939	81.4	81.4	81.4	81.4	81.4	81.4	6444	87.7
1986	6668.3	939	82.0	81.7	81.1	81.2	81.1	81.2	7487	85.5
1987	6883.1	930	83.4	82.3	83.4	82.0	84.5	82.4	7615	86.9
1988	7142.2	930	85.7	83.2	85.5	82.9	87.4	83.7	7850	89.4
1989	7052.2	939	83.9	83.3	83.9	83.1	85.7	84.1	7732	88.3
1990	7070.3	939	85.1	83.6	85.1	83.5	86.0	84.4	7560	86.3
1991	6999.6	953	83.7	83.7	83.7	83.5	83.8	84.3	7660	87.4
1992	7712.1	939	91.9	84.7	91.9	84.6	93.5	85.5	8376	95.4
1993	7016.2	953	84.8	84.7	83.6	84.4	84.0	85.3	7579	86.5
1994	6990.9	953	85.1	84.7	83.5	84.4	83.7	85.2	7553	86.2
1995	8187.0	953	97.8	86.0	97.5	85.6	98.1	86.4	8683	99.1
1996	7687.5	953	91.9	86.5	90.9	86.0	91.8	86.8	8215	93.5
1997	6893.7	953	86.2	86.4	83.7	85.9	82.6	86.5	7668	87.5
1998	8174.1	993	96.6	87.2	96.6	86.7	94.0	87.1	8546	97.6
1999	7491.6	989	89.8	87.4	86.4	86.6	86.5	87.0	8004	91.4
2000	7348.1	989	86.9	87.4	84.6	86.5	84.6	86.9	7808	88.9
2001	8278.1	989	95.5	87.9	95.5	87.1	95.6	87.4	8424	96.2
2002	7918.1	1043	89.2	87.9	88.2	87.1	86.7	87.4	7875	89.9
2003	8002.5	1062	88.2	88.0	88.2	87.2	86.5	87.3	7742	88.4
2004	8813.9	1064	94.9	88.3	94.3	87.6	94.3	87.7	8457	96.3
2005	6765.1	1064	75.9	87.7	72.8	86.8	72.6	86.9	6768	77.3
2006	8872.5	1064	95.6	88.1	95.3	87.2	95.2	87.3	8492	96.9
2007	6008.4	1064	66.1	87.0	64.5	86.2	64.5	86.2	5898	67.3
2008	7856.3	1064	84.4	86.9	84.1	86.1	84.1	86.1	7643	87.0

2009	7747.0	1064	85.5	86.9	83.1	85.9	83.1	86.0	7618	87.0
2010	9201.9	1064	99.0	87.4	98.7	86.5	98.7	86.5	8760	100.0
2011	7599.1	1064	84.4	87.2	81.5	86.3	81.5	86.3	7564	86.3
2012	9064.1	1064	97.2	87.6	97.0	86.7	97.0	86.7	8686	98.9
2013	8012.8	1064	88.0	87.6	86.3	86.7	86.0	86.7	7800	89.0
2014	9114.8	1064	98.1	88.0	97.9	87.1	97.8	87.1	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					213	
B. Refuelling without a maintenance				7		
C. Inspection, maintenance or repair combined with refuelling				611	2	
D. Inspection, maintenance or repair without refuelling				16		
E. Testing of plant systems or components				18		
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
P. Fire					19	
Z. Other					11	
Subtotal	0	0	0	652	251	3
Total	0			906		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		59
12. Reactor I&C Systems		38
13. Reactor Auxiliary Systems		3
15. Reactor Cooling Systems		7
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		64
32. Feedwater and Main Steam System		4
41. Main Generator Systems		25
42. Electrical Power Supply Systems		6
XX. Miscellaneous Systems		1
Total	0	209

# ES-11 TRILLO-1

**Operator:** CNAT (CENTRALES NUCLEARES ALMARAZ-TRILLO(ID/UFG/ENDESA/HC/NUCLENOR ))

**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 1003.0 MW(e)  
**Design Net Capacity:** 990.0 MW(e)  
**Design Discharge Burnup:** 33000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 7785.5 GW(e)·h  
**Energy Availability Factor:** 88.7%  
**Load Factor:** 88.6%  
**Operating Factor:** 90.2%  
**Energy Unavailability Factor:** 11.3%  
**Total Off-line Time:** 859 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	738.4	666.5	736.9	711.9	525.2	49.5	729.5	731.1	709.1	736.4	713.4	737.5	7785.5
<b>EAF (%)</b>	99.0	98.9	98.9	98.6	70.8	6.9	97.8	98.0	98.2	98.6	98.8	98.8	88.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	72.2	6.9	100.0	100.0	99.9	100.0	100.0	100.0	90.0
<b>LF (%)</b>	99.0	98.9	98.9	98.6	70.4	6.8	97.8	98.0	98.2	98.6	98.8	98.8	88.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	72.2	9.4	100.0	100.0	100.0	100.0	100.0	100.0	90.2
<b>EUf (%)</b>	1.0	1.1	1.1	1.4	29.2	93.1	2.2	2.0	1.8	1.4	1.2	1.2	11.3
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	27.8	67.1	0.0	0.0	0.1	0.0	0.0	0.1	7.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
<b>XUF (%)</b>	1.0	1.1	1.1	1.4	1.4	0.0	2.2	2.0	1.7	1.4	1.2	1.1	1.3

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THE PLANT HAS OPERATED AT 100% POWER, EXCEPT DURING PERIODS REPORTED IN OUTAGES

## 5. Historical Summary

**Date of Construction Start:** 17 Aug 1979 **Lifetime Generation:** 199885.1 GW(e)·h  
**Date of First Criticality:** 14 May 1988 **Cumulative Energy Availability Factor:** 86.7%  
**Date of Grid Connection:** 23 May 1988 **Cumulative Load Factor:** 86.3%  
**Date of Commercial Operation:** 06 Aug 1988 **Cumulative Unit Capability Factor:** 87.1%  
**Cumulative Energy Unavailability Factor:** 13.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	2419.5	997	72.7	72.7	72.7	72.7	66.3	66.3	2648	72.1
1989	7147.8	974	83.8	80.5	83.8	80.4	83.8	78.5	7665	87.5
1990	6372.4	974	74.7	78.1	74.7	78.1	74.7	76.9	7170	81.8
1991	6481.5	974	76.0	77.5	76.0	77.5	76.0	76.7	6891	78.7
1992	7938.5	1000	90.4	80.4	90.4	80.4	90.4	79.8	8028	91.4
1993	7395.9	1000	84.4	81.2	84.4	81.2	84.4	80.7	7512	85.8
1994	7927.7	1000	91.0	82.7	91.0	82.7	90.5	82.2	8009	91.4
1995	7472.6	1000	86.4	83.2	85.8	83.1	85.3	82.7	7597	86.7
1996	7626.3	1000	87.4	83.7	87.3	83.7	86.8	83.2	7713	87.8
1997	7765.5	1000	91.9	84.6	89.3	84.3	88.6	83.7	8066	92.1
1998	6589.7	1000	76.1	83.8	75.8	83.4	75.2	82.9	6686	76.3
1999	6828.8	1000	78.0	83.3	78.0	83.0	77.9	82.5	6876	78.5
2000	8206.5	1000	93.7	84.1	93.6	83.8	93.4	83.4	8251	93.9
2001	7907.4	1000	90.7	84.6	90.6	84.3	90.3	83.9	7966	90.9
2002	7827.0	1000	89.6	85.0	89.6	84.7	89.3	84.3	7876	89.9
2003	8114.7	1003	93.1	85.5	93.1	85.2	92.5	84.8	8210	93.7
2004	7980.1	1003	91.5	85.9	91.5	85.6	90.6	85.2	8121	92.4
2005	8080.6	1003	92.9	86.3	92.9	86.1	92.0	85.5	8175	93.3
2006	7687.8	1003	88.6	86.4	88.4	86.2	87.5	85.7	7788	88.9
2007	7948.9	1003	91.5	86.7	91.4	86.5	90.5	85.9	8039	91.8
2008	7744.0	1003	88.7	86.8	88.5	86.6	87.9	86.0	7820	89.0
2009	7197.1	1003	82.5	86.6	82.4	86.4	81.9	85.8	7438	84.9
2010	7695.5	1003	88.5	86.6	87.8	86.4	87.6	85.9	7969	91.0

2011	7835.7	1003	90.4	86.8	89.1	86.5	89.2	86.0	7940	90.6
2012	7948.8	1003	91.3	87.0	90.3	86.7	90.2	86.2	8066	91.8
2013	7487.1	1003	86.6	87.0	85.4	86.7	85.2	86.2	7656	87.4
2014	7785.5	1003	90.0	87.1	88.7	86.7	88.6	86.3	7901	90.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					142	
C. Inspection, maintenance or repair combined with refuelling	672	187		773	0	
D. Inspection, maintenance or repair without refuelling				3		
Subtotal	672	187	0	776	142	0
Total		859			918	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems		36
16. Steam generation systems		11
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System		16
41. Main Generator Systems		10
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems		3
Total	0	137



## ES-16 VANDELLOS-2

**Operator:** ANAV (ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID))

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 1045.0 MW(e)  
**Design Net Capacity:** 930.0 MW(e)  
**Design Discharge Burnup:** 50500 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 8824.9 GW(e)·h  
**Energy Availability Factor:** 96.4%  
**Load Factor:** 96.4%  
**Operating Factor:** 98.9%  
**Energy Unavailability Factor:** 3.6%  
**Total Off-line Time:** 97 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	739.7	696.0	769.2	742.9	765.3	734.9	715.0	745.9	720.0	689.8	738.7	767.5	8824.9
<b>EAF (%)</b>	95.1	99.1	99.1	98.7	98.4	97.7	92.0	95.9	95.7	88.6	98.2	98.7	96.4
<b>UCF (%)</b>	95.7	99.9	99.9	99.7	99.8	99.9	94.8	99.8	99.8	90.7	99.7	99.8	98.3
<b>LF (%)</b>	95.1	99.1	99.1	98.7	98.4	97.7	92.0	95.9	95.7	88.6	98.2	98.7	96.4
<b>OF (%)</b>	97.0	100.0	100.0	100.0	100.0	100.0	96.9	100.0	100.0	93.0	100.0	100.0	98.9
<b>EUf (%)</b>	4.9	0.9	0.9	1.3	1.6	2.3	8.0	4.1	4.3	11.4	1.8	1.3	3.6
<b>PUf (%)</b>	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2
<b>UCLF (%)</b>	4.1	0.0	0.0	0.1	0.1	0.0	5.1	0.0	0.1	9.2	0.1	0.0	1.6
<b>XUF (%)</b>	0.6	0.7	0.8	1.0	1.4	2.2	2.8	3.9	4.1	2.1	1.5	1.1	1.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

SUMMARIZING: IN 2014 VANDELLOS II NPP PRODUCED 9193.624 GROSS GWH, SLIGHTLY LESS THAN EXPECTED GROSS 9216.210 GWH. THE MAIN CAUSES OF THIS DEVIATION ARE:- ON JANUARY 5TH AN AUTOMATIC REACTOR SCRAM OCCURRED DUE TO A LOSS OF 400KV LINE. AFTER SYNCHRONIZING AGAIN, ON 6TH FULL POWER LEVEL IS REACHED AND MAINTAINED UNTIL THE END OF THE MONTH. THE TOTAL OUTAGE WAS 32.566 GWH.- BETWEEN APRIL 2ND AND 5TH THE PLANT OPERATED AT 98% OF RTP DUE TO UNAVAILABILITY OF CALDON SYSTEM. THE TOTAL OUTAGE WAS 0.72 GWH.- BETWEEN MAY 11TH AND 13TH THE PLANT OPERATED AT 95% RTP DUE TO A MALFUNCTION ON VALVE LCV-AF54. THE TOTAL OUTAGE WAS 0.455 GWH.- ON JULY 25TH AN AUTOMATIC REACTOR SCRAM OCCURRED DUE TO LOSS OF THE 400 KV LINE. ON 26TH POWER ASCENSION BEGAN AND 100% POWER LEVEL WAS REACHED ON 27TH. FULL POWER WAS MAINTAINED UNTIL THE END OF THE MONTH. THE TOTAL OUTAGE WAS 39.566 GWH.- ON SEPTEMBER 18TH POWER WAS REDUCED TO TO 99.4% OF RTP DUE TO A MALFUNCTION IN A REHEATER 6B DISCHARGE VALVE. FULL LOAD IS RECOVERED THE NEXT DAY. THE TOTAL OUTAGE WAS 0.336 GWH.- ON OCTOBER 10TH AN AUTOMATIC REACTOR SCRAM OCCURRED DUE TO LOSS OF OFFSITE POWER OF 400 KV AND 220 KV. ONCE THE PROBLEM WAS SOLVED, FULL POWER OPERATION IS RECOVERED ON OCTOBER 13TH AND MAINTAINED UNTIL THE END OF THE MONTH. THE TOTAL OUTAGE WAS 69.838 GWH.- ON NOVEMBER 28TH A POWER REDUCTION WAS INITIATED DUE TO A MALFUNCTION ON THE LEVEL INDICATORS OF REFUELING WATER STORAGE TANK (BN-T01). AFTER THE PROBLEM WAS SOLVED, THE POWER REDUCTION WAS STOPPED AROUND 75% RTP POWER WAS RAISED AGAIN TO 100%. FULL POWER WAS MAINTAINED THE REST OF THE MONTH. THE TOTAL OUTAGE WAS 0.962 GWH. ALL THESE INCIDENTS RESULTED IN A LOAD FACTOR HAS PROVED TO BE OF 96.54%. THE NET PRODUCTION WAS 8824.89 GWH, SLIGHTLY LESS THAN EXPECTED, RESULTING IN A MEASURED/EXPECTED RATIO OF 99.75%.

### 5. Historical Summary

**Date of Construction Start:** 29 Dec 1980 **Lifetime Generation:** 194608.0 GW(e)·h  
**Date of First Criticality:** 14 Nov 1987 **Cumulative Energy Availability Factor:** 82.2%  
**Date of Grid Connection:** 12 Dec 1987 **Cumulative Load Factor:** 82.2%  
**Date of Commercial Operation:** 08 Mar 1988 **Cumulative Unit Capability Factor:** 83.1%  
**Cumulative Energy Unavailability Factor:** 17.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	4610.9	930	68.3	68.3	67.4	67.4	67.5	67.5	5180	70.5
1989	5868.8	943	70.6	69.6	70.6	69.1	71.0	69.4	6357	72.6
1990	7334.3	943	87.8	76.0	87.8	75.7	88.8	76.3	7925	90.5

1991	7214.9	953	88.5	79.3	86.3	78.5	86.4	79.0	7825	89.3
1992	6718.2	953	79.6	79.4	79.6	78.7	80.3	79.2	7249	82.5
1993	6910.4	961	84.3	80.2	82.4	79.4	82.1	79.7	7377	84.2
1994	7208.4	961	85.6	81.0	85.6	80.3	85.6	80.6	7676	87.6
1995	7571.3	961	89.5	82.1	89.5	81.5	89.9	81.8	7957	90.8
1996	7511.4	961	89.1	82.9	89.0	82.3	89.0	82.6	7942	90.4
1997	7243.1	961	88.7	83.5	85.5	82.7	86.0	83.0	7961	90.9
1998	8359.0	966	99.3	85.0	99.0	84.2	98.8	84.4	8760	100.0
1999	7224.4	1024	83.4	84.8	82.5	84.0	80.5	84.1	7430	84.8
2000	7976.9	1043	87.9	85.1	87.6	84.3	87.1	84.3	7852	89.4
2001	9010.3	1043	99.4	86.2	99.4	85.5	98.6	85.4	8727	99.6
2002	8010.1	1040	89.2	86.4	88.1	85.7	87.9	85.6	7881	90.0
2003	8219.3	1040	90.9	86.7	89.5	86.0	90.2	85.9	8067	92.1
2004	8677.0	1045	95.8	87.3	94.5	86.5	94.5	86.5	8429	96.0
2005	4698.4	1045	51.7	85.2	51.3	84.4	51.3	84.4	4657	53.2
2006	7022.7	1045	78.0	84.8	76.2	83.9	76.7	84.0	6882	78.6
2007	5387.8	1045	59.4	83.4	59.1	82.6	58.9	82.6	5313	60.7
2008	6926.0	1045	76.3	83.1	75.4	82.3	75.5	82.3	6922	78.8
2009	5164.1	1045	57.5	81.9	56.4	81.0	56.4	81.0	5241	59.8
2010	8498.8	1045	94.1	82.4	92.8	81.6	92.8	81.6	8293	94.7
2011	7034.3	1045	78.6	82.2	77.3	81.4	76.9	81.4	6894	78.7
2012	7718.6	1045	85.3	82.4	84.3	81.5	84.1	81.5	7549	85.9
2013	7743.0	1045	85.8	82.5	84.8	81.6	84.6	81.6	7676	87.6
2014	8824.9	1045	98.3	83.1	96.4	82.2	96.4	82.2	8663	98.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		96			417	
C. Inspection, maintenance or repair combined with refuelling				686	19	
D. Inspection, maintenance or repair without refuelling				47		
E. Testing of plant systems or components				4	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling					67	
J. Grid limitation, failure or grid unavailability						10
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						1
L. Human factor related					13	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						4
Subtotal	0	96	0	737	517	15
Total		96			1269	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		63
13. Reactor Auxiliary Systems		116
15. Reactor Cooling Systems		27
16. Steam generation systems		1
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		7
33. Circulating Water System		8
41. Main Generator Systems		69
42. Electrical Power Supply Systems	96	90

XX. Miscellaneous Systems		3
Total	96	412

## SE-9 FORSMARK-1

Operator: FKA (FORMARK KRAFTGRUPP AB)

Contractor: ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 984.0 MW(e)  
 Design Net Capacity: 900.0 MW(e)  
 Design Discharge Burnup: 43170 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8086.0 GW(e)·h  
 Energy Availability Factor: 93.5%  
 Load Factor: 93.8%  
 Operating Factor: 94.8%  
 Energy Unavailability Factor: 6.5%  
 Total Off-line Time: 453 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	736.2	663.3	735.1	529.5	436.4	697.8	701.0	716.0	697.3	729.7	707.4	736.2	8086.0
EAF (%)	100.0	99.7	100.0	74.5	59.6	98.3	95.6	97.7	98.3	99.5	99.7	100.0	93.5
UCF (%)	100.0	99.7	100.0	74.5	59.9	100.0	100.0	99.6	100.0	100.0	99.7	100.0	94.4
LF (%)	100.6	100.3	100.4	74.7	59.6	98.5	95.8	97.8	98.4	99.7	99.9	100.6	93.8
OF (%)	100.0	100.0	100.0	75.4	62.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.8
EUUF (%)	0.0	0.3	0.0	25.5	40.4	1.7	4.4	2.3	1.7	0.5	0.3	0.0	6.5
PUF (%)	0.0	0.3	0.0	25.3	40.1	0.0	0.0	0.2	0.0	0.0	0.2	0.0	5.5
UCLF (%)	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.1
XUF (%)	0.0	0.0	0.0	0.0	0.3	1.6	4.4	1.8	1.7	0.5	0.0	0.0	0.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

FORMARK 1 HIGHLIGHTS:ANNUAL OUTAGE TOOK PLACE IN APRIL AND MAY AND INCLUDED IN TOTAL ABOUT 19 DAYS IN TIME. THERE WERE ABOUT 10 PLANT CHANGES PLANNED BUT NONE OF ANY HIGHLIGHT INTEREST.WORTH TO BE MENTIONED IS THAT BIG EFFORTS HAVE BEEN STARTED 2014 IN THE REORGANIZATION PROJECT. THE NEW ORGANIZATION IS PLANNED TO BE IN PLACE IN 2015. VATTENFALL WANTS TO MAKE THE TWO ORGANIZATIONS RINGHALS AND FORMARK MORE SIMILAR.AS A RESULT OF THE POST FUKUSHIMA PROJECT, SEVEN DIESELS HAVE ARRIVED TO THE SITE AND ARE NOW PLANNED FOR PERMANENT FINAL PLACING AND CONNECTION.

### 5. Historical Summary

Date of Construction Start: 01 Jun 1973      Lifetime Generation: 235907.1 GW(e)·h  
 Date of First Criticality: 23 Apr 1980      Cumulative Energy Availability Factor: 84.0%  
 Date of Grid Connection: 06 Jun 1980      Cumulative Load Factor: 82.2%  
 Date of Commercial Operation: 10 Dec 1980      Cumulative Unit Capability Factor: 86.2%  
    Cumulative Energy Unavailability Factor: 16.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	669.6	928	100.0	100.0	100.0	100.0	100.0	100.0	744	100.0
1981	6063.7	900	76.9	78.7	76.9	78.7	76.9	78.7	7305	83.4
1982	5548.1	900	70.4	74.7	70.4	74.7	70.4	74.7	7131	81.4
1983	5926.0	900	75.2	74.9	75.2	74.9	75.2	74.9	8095	92.4
1984	6461.8	900	91.9	79.0	91.9	79.0	81.7	76.5	8207	93.4
1985	5587.6	900	79.4	79.1	79.4	79.1	70.9	75.4	7773	88.7
1986	7317.2	954	89.8	81.0	89.8	81.0	87.5	77.5	8303	94.8
1987	6493.4	970	79.5	80.7	79.5	80.7	76.4	77.4	8291	94.6
1988	6852.8	970	81.8	80.9	81.8	80.9	80.4	77.8	7739	88.1
1989	6138.6	969	85.5	81.4	85.5	81.4	72.3	77.1	7907	90.3
1990	6257.5	972	85.8	81.9	85.8	81.9	73.5	76.8	7885	90.0
1991	7487.6	968	90.6	82.7	88.3	82.5	88.3	77.8	8122	92.7
1992	6833.6	968	85.2	82.9	80.3	82.3	80.4	78.0	8175	93.1
1993	7022.8	968	91.9	83.6	82.7	82.3	82.8	78.4	8010	91.4
1994	7398.2	968	91.4	84.2	87.0	82.7	87.2	79.1	8109	92.6
1995	7325.2	968	91.3	84.7	86.2	82.9	86.4	79.6	8173	93.3
1996	7311.4	968	95.3	85.3	86.4	83.1	86.0	80.0	8412	95.8

1997	5402.9	968	64.6	84.1	64.6	82.0	63.5	79.0	6255	71.2
1998	7307.7	968	93.6	84.6	93.6	82.7	86.2	79.4	8265	94.3
1999	7582.7	968	96.7	85.3	96.3	83.4	89.4	79.9	8420	96.1
2000	5730.8	968	85.9	85.3	67.4	82.6	67.4	79.3	7202	82.0
2001	7286.1	968	94.8	85.8	86.3	82.8	85.9	79.6	8482	96.8
2002	7143.8	961	90.0	86.0	86.0	82.9	84.9	79.8	7978	91.1
2003	7456.0	961	88.5	86.1	88.5	83.1	88.6	80.2	8093	92.4
2004	8032.3	961	97.5	86.5	95.6	83.7	95.2	80.9	8555	97.4
2005	7291.1	1011	85.4	86.5	84.4	83.7	85.1	81.0	7648	87.3
2006	6683.9	995	76.5	86.1	75.4	83.4	75.5	80.8	6806	77.7
2007	6961.4	987	81.1	85.9	80.4	83.3	80.5	80.8	7204	82.2
2008	6973.7	978	81.4	85.7	80.8	83.2	81.1	80.8	7442	84.7
2009	7555.4	978	88.4	85.8	87.9	83.3	88.2	81.1	8029	91.7
2010	7993.6	978	93.4	86.1	92.8	83.6	93.3	81.5	8283	94.6
2011	6776.6	984	79.2	85.9	78.4	83.5	79.0	81.4	7005	80.0
2012	7615.9	984	88.2	85.9	87.7	83.6	88.1	81.6	7938	90.4
2013	7539.6	984	87.8	86.0	87.1	83.7	87.5	81.8	7782	88.8
2014	8086.0	984	94.4	86.2	93.5	84.0	93.8	82.2	8307	94.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					144	
C. Inspection, maintenance or repair combined with refuelling	446			630		
D. Inspection, maintenance or repair without refuelling				20		
E. Testing of plant systems or components				3		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				29		
H. Nuclear regulatory requirements					8	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						12
L. Human factor related		0			32	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					3	
Z. Other				0		
Subtotal	446	0	0	682	187	13
Total		446			882	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		46
12. Reactor I&C Systems		11
13. Reactor Auxiliary Systems		4
14. Safety Systems		1
15. Reactor Cooling Systems		10
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System		2
41. Main Generator Systems		4
42. Electrical Power Supply Systems		49
XX. Miscellaneous Systems		1
Total	0	140

## SE-11 FORSMARK-2

Operator: FKA (FORSMARK KRAFTGRUPP AB)

Contractor: ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1120.0 MW(e)  
 Design Net Capacity: 900.0 MW(e)  
 Design Discharge Burnup: 42000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8796.4 GW(e)·h  
 Energy Availability Factor: 89.4%  
 Load Factor: 89.7%  
 Operating Factor: 91.2%  
 Energy Unavailability Factor: 10.6%  
 Total Off-line Time: 769 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	839.5	755.2	837.6	808.1	597.0	87.5	793.2	816.1	789.5	830.0	807.2	835.4	8796.4
EAF (%)	100.0	99.6	100.0	99.9	71.7	10.9	95.2	97.9	97.9	99.5	100.0	99.7	89.4
UCF (%)	100.0	99.6	100.0	100.0	71.9	11.0	99.7	99.8	99.6	100.0	100.0	99.7	90.1
LF (%)	100.8	100.3	100.5	100.2	71.6	10.9	95.2	97.9	97.9	99.6	100.1	100.3	89.7
OF (%)	100.0	100.0	100.0	100.0	78.5	15.4	100.0	100.0	100.0	100.0	100.0	100.0	91.2
EUf (%)	0.0	0.4	0.0	0.1	28.3	89.1	4.8	2.1	2.1	0.5	0.0	0.3	10.6
PUf (%)	0.0	0.4	0.0	0.0	26.0	60.0	0.3	0.0	0.3	0.0	0.0	0.3	7.3
UCLF (%)	0.0	0.0	0.0	0.0	2.1	29.0	0.0	0.2	0.2	0.0	0.0	0.0	2.6
XUF (%)	0.0	0.0	0.0	0.1	0.2	0.2	4.5	1.9	1.7	0.5	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

FORSMARK 2 HIGHLIGHTS:2014 WAS A SPECIAL YEAR FOR FORSMARK 2. THE TOTAL PRODUCED NET ENERGY OF THE YEAR WAS 8,7964 TWH THAT WAS ALL TIME HIGH! THE UNIT WAS IN TEMPORARY/TEST OPERATION OF 120% POWER AND WILL 2015 APPLY FOR THIS LEVEL OF POWER BY THE REGULATOR.ANNUAL OUTAGE WAS TAKING PLACE IN MAY AND JUNE AND INCLUDED IN TOTAL ABOUT 32 DAYS IN TIME. THERE WERE ABOUT 17 PLANT CHANGES PLANNED BUT NONE OF ANY HIGHLIGHT INTEREST.WORTH TO BE MENTIONED IS THAT BIG EFFORTS HAVE BEEN STARTED 2014 IN THE REORGANIZATION PROJECT. THE NEW ORGANIZATION IS PLANNED TO BE IN PLACE IN 2015. VATTENFALL WANTS TO MAKE THE TWO ORGANIZATIONS RINGHALS AND FORSMARK MORE SIMILAR.AS A RESULT OF THE POST FUKUSHIMA PROJECT, SEVEN DIESELS HAVE ARRIVED TO THE SITE AND ARE NOW PLANNED FOR PERMANENT FINAL PLACING AND CONNECTION.

### 5. Historical Summary

Date of Construction Start: 01 Jan 1975      Lifetime Generation: 227852.5 GW(e)·h  
 Date of First Criticality: 16 Nov 1980      Cumulative Energy Availability Factor: 82.4%  
 Date of Grid Connection: 26 Jan 1981      Cumulative Load Factor: 80.2%  
 Date of Commercial Operation: 07 Jul 1981      Cumulative Unit Capability Factor: 84.4%  
    Cumulative Energy Unavailability Factor: 17.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	2870.7	900	72.2	72.2	72.2	72.2	72.2	72.2	3977	90.1
1982	5316.4	900	67.4	69.0	67.4	69.0	67.4	69.0	6076	69.4
1983	5484.4	900	69.6	69.2	69.6	69.2	69.6	69.2	7879	89.9
1984	5911.7	900	82.6	73.1	82.6	73.0	74.8	70.8	7442	84.7
1985	5735.4	900	83.8	75.4	83.8	75.4	72.7	71.3	8048	91.9
1986	6987.9	938	86.5	77.5	86.5	77.5	85.0	73.8	8231	94.0
1987	6553.8	949	85.5	78.8	85.5	78.8	78.8	74.6	8190	93.5
1988	6976.2	963	83.2	79.4	83.2	79.4	82.5	75.7	8032	91.4
1989	5943.4	964	90.0	80.7	90.0	80.7	70.4	75.1	8222	93.9
1990	6426.2	972	88.6	81.6	88.6	81.6	75.5	75.1	8119	92.7
1991	7155.2	969	85.8	82.0	84.2	81.8	84.3	76.0	8084	92.3
1992	6748.9	969	86.2	82.4	79.2	81.6	79.3	76.3	8294	94.4
1993	6715.5	969	88.8	82.9	79.1	81.4	79.1	76.5	7684	87.7
1994	7679.5	969	92.5	83.6	90.4	82.1	90.5	77.6	8194	93.5
1995	7149.2	969	91.6	84.2	84.1	82.2	84.2	78.1	8144	93.0

1996	7348.2	969	91.2	84.7	86.2	82.5	86.3	78.6	8135	92.6
1997	7325.3	969	87.4	84.8	87.4	82.8	86.1	79.1	7927	90.2
1998	7198.6	969	92.1	85.3	91.9	83.3	84.8	79.4	8240	94.1
1999	7292.3	964	91.7	85.6	91.7	83.8	86.0	79.8	8117	92.7
2000	5428.1	964	79.6	85.3	66.3	82.9	64.1	79.0	6939	79.0
2001	7399.6	964	92.3	85.7	88.8	83.2	87.6	79.4	8321	95.0
2002	6823.9	959	89.9	85.9	82.2	83.1	81.0	79.5	8155	93.1
2003	7303.9	954	87.1	85.9	87.1	83.3	87.0	79.8	7916	90.4
2004	7982.2	954	96.9	86.4	95.2	83.8	95.3	80.5	8529	97.1
2005	7790.1	951	94.6	86.7	93.7	84.2	93.5	81.0	8348	95.3
2006	6011.9	951	73.1	86.2	72.5	83.8	72.2	80.7	6426	73.4
2007	7470.1	1000	85.7	86.2	85.0	83.8	85.3	80.8	7750	88.5
2008	6920.1	990	79.7	85.9	79.2	83.6	79.4	80.8	7342	83.6
2009	5530.7	990	64.1	85.1	63.6	82.9	63.8	80.2	5902	67.4
2010	3334.2	990	38.6	83.5	38.3	81.3	38.4	78.7	7635	87.2
2011	8161.6	996	93.9	83.9	93.2	81.7	93.8	79.2	8259	94.3
2012	7464.9	996	85.7	83.9	85.0	81.9	85.3	79.4	7747	88.2
2013	8697.9	1120	91.9	84.2	91.2	82.2	91.1	79.8	8239	94.1
2014	8796.4	1120	90.1	84.4	89.4	82.4	89.7	80.2	7991	91.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		200			217	
B. Refuelling without a maintenance				5		
C. Inspection, maintenance or repair combined with refuelling	569			511		
D. Inspection, maintenance or repair without refuelling				82		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				41		
H. Nuclear regulatory requirements					23	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						14
L. Human factor related					16	
P. Fire					3	
Z. Other				0		
Subtotal	569	200	0	639	259	14
Total		769			912	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	193	65
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		7
14. Safety Systems		14
15. Reactor Cooling Systems		13
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		62
32. Feedwater and Main Steam System		6
41. Main Generator Systems	7	
42. Electrical Power Supply Systems		27
XX. Miscellaneous Systems		16
Total	200	214

## SE-14 FORSMARK-3

Operator: FKA (FORSMARK KRAFTGRUPP AB)

Contractor: ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1170.0 MW(e)  
 Design Net Capacity: 1050.0 MW(e)  
 Design Discharge Burnup: 43220 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8471.8 GW(e)·h  
 Energy Availability Factor: 82.3%  
 Load Factor: 82.7%  
 Operating Factor: 83.6%  
 Energy Unavailability Factor: 17.7%  
 Total Off-line Time: 1434 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	879.1	795.5	868.1	680.1	867.2	822.0	689.3	0.0	299.0	861.4	840.8	869.3	8471.8
EAF (%)	99.9	100.0	99.0	80.3	99.6	97.6	79.2	0.0	35.5	98.8	99.8	99.2	82.3
UCF (%)	99.9	100.0	99.0	80.4	100.0	100.0	83.6	0.0	36.2	100.0	100.0	99.2	83.1
LF (%)	101.0	101.2	99.7	80.7	99.6	97.6	79.2	0.0	35.5	99.0	99.8	99.9	82.7
OF (%)	100.0	100.0	100.0	82.5	100.0	100.0	83.9	0.0	38.3	100.0	100.0	100.0	83.6
EUf (%)	0.1	0.0	1.0	19.7	0.4	2.4	20.8	100.0	64.5	1.2	0.2	0.8	17.7
PUf (%)	0.1	0.0	0.0	0.0	0.0	0.0	16.4	100.0	53.8	0.0	0.0	0.1	14.3
UCLF (%)	0.0	0.0	1.0	19.6	0.0	0.1	0.0	0.0	10.0	0.0	0.0	0.7	2.6
XUF (%)	0.0	0.0	0.0	0.0	0.4	2.4	4.4	0.0	0.7	1.2	0.2	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

FORSMARK 3 HIGHLIGHTS: THE ANNUAL OUTAGE TOOK PLACE IN JULY AND SEPTEMBER, AND IN TOTAL INCLUDED ABOUT 54.5 DAYS IN TIME. THE LARGEST ACTIVITIES THAT WERE CARRIED OUT ON THE REACTOR SIDE WERE: -EXCHANGE OF ELECTRICAL PENETRATIONS IN DIVISION A AND C IN THE LOWER REACTOR CONTAINMENT. -EXCHANGE TWO SWEEPOLET TO FORGED ONES IN THE FEED WATER SYSTEM, AND ALSO TWO CONNECTIONS TO RHR WITH THE SYSTEM 321 WERE EXCHANGED. THIS TO FACILITATE EASIER FUTURE INSPECTION OF WELDS. -IMPROVED RHR CAPACITY IN DIVISION A- SUB FOR BETTER MARGINS (BY INSERTING CLAMP FILTER AND NEW HEAT EXCHANGER. THE MAJOR MAINTENANCE MEASURES CARRIED OUT ON REACTOR SIDE WERE A REVIEW ON THREE OF THE MAIN CIRCULATIONS PUMPS, EXCHANGE OF 11OF THE ELECTRIC FINE MOTION CONTROL ROD DRIVES (FMCRD) AND THE PLANNED 10-YEAR PERIODIC INSPECTION ON THE REACTOR VESSEL. ON TURBINE SIDE FOLLOWING MAIN ACTIVITIES WERE CARRIED OUT: -EXCHANGE OF HIGH PRESSURE TURBINE WAS THE LARGEST ACTIVITY. -ON THE TURBINE SIDE THERE WAS ALSO A CONTROL OF LOW- PRESSURE TURBINES AND FIXING/REPAIR OF CONCRETE IN COOLING CHANNELS. -WORK WAS ALSO CARRIED OUT TO, IN A LONG TERM PERSPECTIVE, BE ABLE TO INTRODUCE A DIVERSIFICATION TO THE FOUR REGULAR RHR DIVISIONS BY ORDER TO CONNECT EXTERNAL COOLING FACILITY. -DURING THE OUTAGE THERE WERE A TOTAL OF 4778 WORK ORDERS HANDLED. AND A TOTAL OF ABOUT 2100 PERSONS HAVE BEEN INVOLVED IN THE ANNUAL OUTAGE ACTIVITIES.

### 5. Historical Summary

Date of Construction Start: 01 Jan 1979      Lifetime Generation: 252753.0 GW(e)·h  
 Date of First Criticality: 28 Oct 1984      Cumulative Energy Availability Factor: 86.2%  
 Date of Grid Connection: 05 Mar 1985      Cumulative Load Factor: 84.8%  
 Date of Commercial Operation: 18 Aug 1985      Cumulative Unit Capability Factor: 88.6%  
    Cumulative Energy Unavailability Factor: 13.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	3296.6	1068	93.8	93.8	93.8	93.8	85.5	85.5	3509	95.5
1986	8069.6	1060	88.4	90.0	88.4	90.0	86.9	86.5	7983	91.1
1987	7038.9	1063	77.9	84.9	77.9	84.9	75.6	82.0	7866	89.8
1988	7462.9	1068	80.4	83.6	80.4	83.6	79.6	81.3	7807	88.9
1989	7367.2	1118	85.8	84.1	85.8	84.1	75.2	79.8	7792	88.9
1990	7942.1	1150	91.3	85.5	80.1	83.3	78.8	79.6	8165	93.2
1991	8665.1	1155	87.5	85.8	85.6	83.7	85.6	80.6	8325	95.0
1992	8176.2	1197	89.5	86.4	81.2	83.3	77.8	80.2	7963	90.7



1993	8457.9	1158	93.2	87.2	83.4	83.3	83.4	80.6	8251	94.2
1994	9228.8	1158	93.4	87.9	90.9	84.2	91.0	81.7	8277	94.5
1995	8930.9	1158	92.8	88.4	88.2	84.6	88.0	82.3	8250	94.2
1996	8819.2	1158	89.1	88.4	86.7	84.8	86.7	82.7	8008	91.2
1997	8955.2	1158	89.9	88.6	89.9	85.2	88.0	83.2	8004	91.1
1998	8960.7	1158	93.9	89.0	93.8	85.8	88.3	83.6	8227	93.9
1999	8825.5	1155	91.1	89.1	91.0	86.2	87.1	83.8	8005	91.4
2000	7933.9	1157	94.9	89.5	87.7	86.3	78.1	83.4	8038	91.5
2001	8182.4	1155	86.2	89.3	81.8	86.0	80.9	83.3	7585	86.6
2002	9079.4	1158	95.0	89.6	91.2	86.3	89.5	83.6	8450	96.5
2003	9100.3	1155	89.9	89.6	89.9	86.5	89.9	84.0	8507	97.1
2004	8973.5	1185	89.4	89.6	87.7	86.6	87.7	84.2	7920	90.2
2005	9868.8	1190	96.2	90.0	94.6	87.0	94.7	84.7	8491	96.9
2006	9600.5	1170	94.6	90.2	92.4	87.3	92.2	85.1	8323	95.0
2007	8992.6	1170	88.2	90.1	87.3	87.3	87.7	85.2	7770	88.7
2008	7109.8	1170	69.7	89.2	68.8	86.4	69.2	84.5	6185	70.4
2009	8815.5	1170	86.0	89.1	85.5	86.4	86.0	84.6	7624	87.0
2010	8320.2	1170	81.4	88.8	80.6	86.2	81.2	84.4	7317	83.5
2011	8691.3	1170	85.4	88.6	84.3	86.1	84.8	84.4	7515	85.8
2012	9520.5	1170	93.0	88.8	92.1	86.3	92.6	84.8	8212	93.5
2013	9021.7	1170	88.6	88.8	87.6	86.4	88.0	84.9	7830	89.4
2014	8471.8	1170	83.1	88.6	82.3	86.2	82.7	84.8	7326	83.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		126			125	
C. Inspection, maintenance or repair combined with refuelling	1238			598		
D. Inspection, maintenance or repair without refuelling				10		
E. Testing of plant systems or components		72		2		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				8		
H. Nuclear regulatory requirements					9	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						6
L. Human factor related					1	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					2	
Z. Other						0
Subtotal	1238	198	0	618	137	6
Total		1436			761	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	126	21
12. Reactor I&C Systems		61
13. Reactor Auxiliary Systems		3
15. Reactor Cooling Systems		10
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		1
41. Main Generator Systems		0
42. Electrical Power Supply Systems		12
Total	126	121

## SE-2 OSKARSHAMN-1

Operator: OKG (OKG AKTIEBOLAG)

Contractor: ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 473.0 MW(e)  
 Design Net Capacity: 440.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3053.4 GW(e)·h  
 Energy Availability Factor: 73.7%  
 Load Factor: 73.7%  
 Operating Factor: 80.2%  
 Energy Unavailability Factor: 26.3%  
 Total Off-line Time: 1732 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	239.1	318.1	345.4	0.0	0.0	250.6	314.3	322.1	308.2	318.9	311.5	325.2	3053.4
EAF (%)	67.9	100.0	98.3	0.0	0.0	73.6	89.3	91.5	90.5	90.5	91.5	92.4	73.7
UCF (%)	68.1	100.0	98.4	0.0	0.0	78.2	93.9	93.4	93.0	92.5	92.6	92.9	75.2
LF (%)	67.9	100.1	98.3	0.0	0.0	73.6	89.3	91.5	90.5	90.5	91.5	92.4	73.7
OF (%)	72.8	100.0	99.2	0.0	0.0	91.7	100.0	100.0	100.0	100.0	100.0	100.0	80.2
EUf (%)	32.1	0.0	1.7	100.0	100.0	26.4	10.7	8.5	9.5	9.5	8.5	7.6	26.3
PUf (%)	0.0	0.0	1.5	100.0	48.3	0.5	0.1	0.0	0.1	0.2	0.2	0.0	12.5
UCLF (%)	31.9	0.0	0.1	0.0	51.7	21.3	6.0	6.6	6.9	7.4	7.2	7.1	12.3
XUF (%)	0.2	0.0	0.2	0.0	0.0	4.7	4.6	1.9	2.5	2.0	1.1	0.5	1.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

POWER REDUCTION (REACTOR POWER LIMITATION 93%) FROM JUNE TO DECEMBER DUE TO TURBINE (HIGH PRESSURE) VIBRATION. THE ENERGY PRODUCTION THIS YEAR WAS THE HIGHEST SINCE YEAR 2010, DESPITE TURBINE VIBRATION.RECORD IN NUMBER OF DAYS (212 DAYS) WITH PRODUCTION IN ONE ROW WITHOUT NO SHUTDOWN.

### 5. Historical Summary

Date of Construction Start: 01 Aug 1966      Lifetime Generation: 102714.0 GW(e)·h  
 Date of First Criticality: 12 Dec 1970      Cumulative Energy Availability Factor: 61.5%  
 Date of Grid Connection: 19 Aug 1971      Cumulative Load Factor: 60.4%  
 Date of Commercial Operation: 06 Feb 1972      Cumulative Unit Capability Factor: 61.9%  
    Cumulative Energy Unavailability Factor: 38.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1972	1253.4	440	35.2	35.2	35.2	35.2	35.4	35.4	3318	41.3
1973	1967.9	440	49.9	42.9	49.9	42.9	51.1	43.6	4871	55.6
1974	1283.9	440	33.4	39.6	33.4	39.6	33.3	40.1	3067	35.0
1975	2435.3	440	69.5	47.3	69.5	47.3	63.2	46.0	6483	74.0
1976	2469.5	440	62.1	50.3	62.1	50.3	63.9	49.6	6278	71.5
1977	2677.1	440	69.5	53.5	69.5	53.5	69.5	53.0	6540	74.7
1978	3113.8	440	80.3	57.4	80.3	57.4	80.8	57.0	7390	84.4
1979	2716.4	440	70.0	59.0	70.0	59.0	70.5	58.7	6422	73.3
1980	2994.0	440	77.4	61.0	77.4	61.0	77.5	60.8	7221	82.2
1981	2885.7	440	75.1	62.5	75.1	62.5	74.9	62.2	7094	81.0
1982	2937.7	440	76.2	63.7	76.2	63.7	76.2	63.5	6966	79.5
1983	3133.4	440	81.8	65.2	81.8	65.2	81.3	65.0	7693	87.8
1984	2959.9	440	82.2	66.6	82.2	66.6	76.6	65.9	7249	82.5
1985	2753.2	440	73.4	67.0	71.8	66.9	71.4	66.3	6490	74.1
1986	3134.4	440	83.0	68.1	83.0	68.0	81.3	67.3	7350	83.9
1987	3232.5	440	88.6	69.4	88.6	69.3	83.9	68.3	7808	89.1
1988	2863.3	442	74.6	69.7	74.5	69.6	73.8	68.7	6827	77.7
1989	3175.6	442	87.6	70.7	86.9	70.6	82.0	69.4	7787	88.9
1990	2493.8	442	64.9	70.4	64.6	70.3	64.4	69.1	5793	66.1
1991	3349.2	442	89.3	71.4	88.9	71.2	86.5	70.0	7855	89.7

1992	1784.8	442	49.7	70.3	49.4	70.2	46.0	68.9	4339	49.4
1993	0.0	445	0.0	67.1	0.0	66.9	0.0	65.7	0	0.0
1994	0.0	445	0.0	64.1	0.0	64.0	0.0	62.8	0	0.0
1995	0.0	445	0.0	61.4	0.0	61.3	0.0	60.2	0	0.0
1996	2380.0	445	61.6	61.4	60.9	61.3	60.9	60.2	5654	64.4
1997	2925.9	445	75.9	62.0	74.6	61.8	75.1	60.8	6716	76.7
1998	1297.7	445	32.6	60.9	32.6	60.7	33.3	59.7	2968	33.9
1999	3298.9	445	86.7	61.8	86.7	61.6	84.6	60.6	7647	87.3
2000	3060.2	445	88.8	62.8	88.1	62.6	78.3	61.2	7765	88.4
2001	3080.9	445	83.7	63.5	83.1	63.2	79.0	61.8	7449	85.0
2002	0.0	445	0.0	61.4	0.0	61.2	0.0	59.8	0	0.0
2003	3058.4	467	75.7	61.9	75.3	61.6	74.5	60.3	7075	80.8
2004	3536.5	467	87.6	62.7	87.4	62.5	86.2	61.1	7743	88.1
2005	3265.9	467	79.8	63.2	79.4	63.0	79.8	61.7	7129	81.4
2006	2088.4	467	51.3	62.9	50.9	62.6	51.0	61.4	4520	51.6
2007	2575.1	467	64.1	62.9	63.2	62.6	62.9	61.4	5703	65.1
2008	3496.4	473	88.4	63.6	85.5	63.3	84.7	62.1	7583	86.3
2009	2831.6	473	70.8	63.8	69.7	63.5	68.3	62.3	6657	76.0
2010	3185.4	473	78.7	64.2	78.1	63.9	76.9	62.7	7039	80.4
2011	2979.6	473	73.3	64.5	72.2	64.1	71.9	62.9	6484	74.0
2012	30.8	473	0.8	62.8	0.7	62.5	0.7	61.3	110	1.3
2013	541.6	473	14.3	61.6	13.9	61.2	13.1	60.1	1659	18.9
2014	3053.4	473	75.2	61.9	73.7	61.5	73.7	60.4	7028	80.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		646			972	
C. Inspection, maintenance or repair combined with refuelling	1085			809	58	
D. Inspection, maintenance or repair without refuelling				591		
E. Testing of plant systems or components				3	3	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				194	7	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				10		
H. Nuclear regulatory requirements					264	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					21	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
U. Security and access control and other preventive shutdown due to external threats						1
Z. Other					104	
Subtotal	1085	646	0	1607	1429	6
Total		1731			3042	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		200
12. Reactor I&C Systems		87
13. Reactor Auxiliary Systems		12
14. Safety Systems	384	55
15. Reactor Cooling Systems		24
31. Turbine and auxiliaries	262	388
32. Feedwater and Main Steam System		26
33. Circulating Water System		0
35. All other I&C Systems		3

41. Main Generator Systems		62
42. Electrical Power Supply Systems		108
XX. Miscellaneous Systems		1
Total	646	966

## SE-3 OSKARSHAMN-2

Operator: OKG (OKG AKTIEBOLAG)

Contractor: ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 638.0 MW(e)  
 Design Net Capacity: 580.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 0.0 GW(e)·h  
 Energy Availability Factor: 0.0%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.0%  
 Total Off-line Time: 8760 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EUUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

PROJECT PLEX (PLANT LIFE EXTENSION) STARTED 1ST OF JUNE 2013 AND STILL ONGOING. DESCRIPTION OF THE PROJECT PLEX, SEE OPERATING EXPERIENCE FOR YEAR 2013.

### 5. Historical Summary

Date of Construction Start: 01 Sep 1969      Lifetime Generation: 153997.0 GW(e)·h  
 Date of First Criticality: 06 Mar 1974      Cumulative Energy Availability Factor: 76.5%  
 Date of Grid Connection: 02 Oct 1974      Cumulative Load Factor: 73.3%  
 Date of Commercial Operation: 01 Jan 1975      Cumulative Unit Capability Factor: 77.4%  
    Cumulative Energy Unavailability Factor: 23.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	3010.9	565	60.9	60.9	60.9	60.9	60.8	60.8	5694	65.0
1976	2892.9	565	59.1	60.0	59.1	60.0	58.3	59.6	5744	65.4
1977	3360.7	565	69.0	63.0	69.0	63.0	67.9	62.3	6372	72.7
1978	3638.3	565	74.4	65.8	74.4	65.8	73.5	65.1	6695	76.4
1979	3789.4	565	80.3	68.7	80.3	68.7	76.6	67.4	7473	85.3
1980	4172.3	565	87.4	71.8	87.4	71.8	84.1	70.2	7699	87.6
1981	3836.1	565	81.0	73.2	81.0	73.2	77.5	71.2	7433	84.9
1982	4248.9	565	89.0	75.1	89.0	75.1	85.8	73.1	7904	90.2
1983	4054.5	590	86.2	76.4	86.2	76.4	78.7	73.7	7703	87.9
1984	4666.1	590	92.8	78.1	92.8	78.1	90.0	75.4	8252	93.9
1985	3932.3	590	87.2	79.0	87.2	79.0	76.1	75.5	7739	88.3
1986	4277.8	590	87.9	79.7	87.9	79.7	82.8	76.1	7770	88.7
1987	4230.8	590	87.7	80.4	87.4	80.3	81.9	76.6	7789	88.9
1988	4417.4	605	88.0	80.9	86.9	80.8	83.6	77.1	7894	89.9
1989	3960.7	605	88.4	81.4	86.3	81.2	74.7	76.9	8065	92.1
1990	4050.3	605	88.6	81.9	86.5	81.6	76.4	76.9	7885	90.0
1991	4103.4	605	83.9	82.0	82.0	81.6	77.4	76.9	7467	85.2
1992	2851.5	605	60.3	80.8	59.1	80.3	53.7	75.6	5310	60.5
1993	2611.5	605	55.0	79.4	53.7	78.8	49.3	74.1	4964	56.7
1994	4460.6	605	88.8	79.9	86.9	79.3	84.2	74.7	7884	90.0
1995	4175.8	605	83.7	80.0	82.3	79.4	78.8	74.9	7449	85.0
1996	3760.4	605	73.1	79.7	71.7	79.0	70.8	74.7	6543	74.5

1997	4417.4	605	86.4	80.0	85.4	79.3	83.4	75.1	7707	88.0
1998	4457.8	605	90.3	80.5	90.3	79.8	84.1	75.4	7951	90.8
1999	3198.2	605	63.3	79.8	62.5	79.1	60.3	74.8	5667	64.7
2000	3898.5	605	85.2	80.0	83.5	79.3	73.4	74.8	7525	85.7
2001	4748.5	602	92.3	80.4	90.8	79.7	90.0	75.3	8147	93.0
2002	4508.6	602	91.2	80.8	90.6	80.1	85.5	75.7	8043	91.8
2003	3055.3	602	59.8	80.1	59.2	79.4	57.9	75.1	5289	60.4
2004	4625.9	602	89.1	80.4	87.7	79.6	87.5	75.5	7900	89.9
2005	4728.1	602	92.3	80.8	90.0	80.0	89.7	76.0	8187	93.5
2006	4125.3	602	79.7	80.7	78.4	79.9	78.2	76.0	7089	80.9
2007	3993.2	602	77.8	80.7	76.4	79.8	76.1	76.0	6922	79.0
2008	4504.2	590	88.7	80.9	86.6	80.0	86.3	76.4	7871	89.6
2009	3950.0	624	78.1	80.8	76.5	79.9	75.3	76.3	7141	81.5
2010	5032.9	638	92.6	81.2	91.3	80.3	90.1	76.7	8265	94.3
2011	4210.2	638	76.6	81.0	75.8	80.1	75.3	76.7	7020	80.1
2012	3969.4	638	72.5	80.8	72.0	79.9	70.8	76.5	7207	82.0
2013	1735.4	638	32.7	79.5	31.6	78.6	31.1	75.3	3334	38.1
2014	0.0	638	0.0	77.4	0.0	76.5	0.0	73.3	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					233	
C. Inspection, maintenance or repair combined with refuelling				838	92	
D. Inspection, maintenance or repair without refuelling				37	6	
E. Testing of plant systems or components				0	23	
F. Major back-fitting, refurbishment or upgrading activities with refuelling	8760			142		
H. Nuclear regulatory requirements					111	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					3	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
P. Fire					1	
Z. Other					75	
Subtotal	8760	0	0	1017	544	2
Total		8760			1563	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		22
12. Reactor I&C Systems		10
13. Reactor Auxiliary Systems		0
14. Safety Systems		6
15. Reactor Cooling Systems		19
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		106
32. Feedwater and Main Steam System		16
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems		6
42. Electrical Power Supply Systems		31
XX. Miscellaneous Systems		10
Total	0	227

## SE-12 OSKARSHAMN-3

Operator: OKG (OKG AKTIEBOLAG)

Contractor: ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1400.0 MW(e)

Design Net Capacity: 1050.0 MW(e)

Design Discharge Burnup: 32000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 9215.5 GW(e)·h

Energy Availability Factor: 75.1%

Load Factor: 75.1%

Operating Factor: 80.9%

Energy Unavailability Factor: 24.9%

Total Off-line Time: 1677 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	942.2	864.4	951.1	861.1	0.0	0.0	674.9	1005.5	935.8	992.7	985.1	1002.6	9215.5
EAF (%)	90.5	91.9	91.4	85.4	0.0	0.0	64.8	96.5	92.8	95.2	97.7	96.3	75.1
UCF (%)	91.6	92.5	92.4	87.1	0.0	0.0	71.8	99.9	97.0	98.5	99.9	97.5	77.3
LF (%)	90.5	91.9	91.4	85.4	0.0	0.0	64.8	96.5	92.8	95.2	97.7	96.3	75.1
OF (%)	100.0	100.0	100.0	93.5	0.0	0.0	77.7	100.0	100.0	100.0	100.0	100.0	80.9
EUf (%)	9.5	8.1	8.6	14.6	100.0	100.0	35.2	3.5	7.2	4.8	2.3	3.7	24.9
PUf (%)	0.9	0.0	0.0	0.6	93.5	98.2	5.8	0.0	0.0	0.4	0.1	0.6	16.7
UCLF (%)	7.6	7.5	7.6	12.3	6.5	1.8	22.4	0.1	3.0	1.0	0.1	1.9	6.0
XUF (%)	1.1	0.6	1.0	1.6	0.0	0.0	7.0	3.4	4.2	3.3	2.1	1.3	2.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

DURING ANNUAL OUTAGE WITH REFUELLING PROJECT MILK WAS CARRIED OUT. REASON FOR THE PROJECT IS TO REACH THE NEW ENVIRONMENTAL REQUIREMENTS FROM THE SWEDISH AUTHORITY. A LARGE NUMBER OF COMPONENTS IN DIFFERENT PROCESS SYSTEM WERE EXCHANGED DURING THIS OUTAGE. MOST COMPREHENSIVE ACTIONS WAS IN THE REACTOR CONTAINMENT WHERE ALL THE ELECTRICAL PENETRATION AND 1500 CABLES WERE EXCHANGED. CABLES, COMPONENTS AND CABINET WERE PREFABRICATED TO REDUCE THE SCHEDULE FOR THE INSTALLATION PHASE.

### 5. Historical Summary

Date of Construction Start: 01 May 1980      Lifetime Generation: 236061.0 GW(e)·h

Date of First Criticality: 29 Dec 1984      Cumulative Energy Availability Factor: 80.9%

Date of Grid Connection: 03 Mar 1985      Cumulative Load Factor: 77.4%

Date of Commercial Operation: 15 Aug 1985      Cumulative Unit Capability Factor: 81.8%

   Cumulative Energy Unavailability Factor: 19.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	3070.3	1055	93.0	93.0	93.0	93.0	79.3	79.3	3429	93.4
1986	8386.9	1060	91.9	92.2	91.9	92.2	90.4	87.1	8111	92.6
1987	7058.0	1065	89.6	91.2	89.4	91.1	75.7	82.4	7988	91.2
1988	7311.9	1060	83.9	89.0	83.6	88.9	78.4	81.2	7457	84.9
1989	7788.2	1035	93.1	89.9	92.8	89.7	84.4	81.9	8241	94.1
1990	7640.2	1060	84.1	88.9	83.2	88.6	83.2	82.1	7781	88.8
1991	8935.8	1160	91.6	89.3	90.9	89.0	87.9	83.1	8183	93.4
1992	8270.6	1160	90.1	89.4	89.5	89.0	81.2	82.8	7903	90.0
1993	8339.5	1160	91.7	89.7	90.9	89.3	82.1	82.7	8026	91.6
1994	8480.4	1160	89.1	89.7	88.4	89.2	83.5	82.8	7878	89.9
1995	8828.1	1160	89.8	89.7	87.5	89.0	86.9	83.2	7957	90.8
1996	8518.4	1153	85.1	89.3	84.6	88.6	84.1	83.3	7543	85.9
1997	8970.4	1155	91.0	89.4	89.8	88.7	88.6	83.8	8042	91.8
1998	8032.3	1155	89.3	89.4	88.7	88.7	79.4	83.4	7914	90.3
1999	8516.7	1155	89.7	89.4	88.9	88.7	84.2	83.5	7850	89.6
2000	7219.1	1155	91.2	89.5	91.2	88.9	71.2	82.6	8075	91.9
2001	9052.0	1155	92.6	89.7	91.8	89.1	89.5	83.1	8170	93.3
2002	8884.0	1155	92.2	89.9	92.2	89.2	87.8	83.4	8140	92.9

2003	7678.0	1155	78.0	89.2	76.2	88.5	75.9	82.9	6871	78.4
2004	9318.5	1149	93.0	89.4	92.4	88.7	92.3	83.4	8236	93.8
2005	8573.4	1149	86.7	89.3	86.2	88.6	85.2	83.5	7671	87.6
2006	9522.5	1149	96.3	89.6	94.9	88.9	94.6	84.0	8467	96.6
2007	8829.2	1150	89.6	89.6	87.8	88.8	87.6	84.2	7965	90.9
2008	7100.9	1152	71.4	88.8	70.4	88.0	70.2	83.6	6424	73.1
2009	1684.7	1152	16.8	85.8	16.8	85.1	16.7	80.8	1795	20.5
2010	3841.8	1400	32.0	83.2	31.6	82.5	31.3	78.4	4783	54.6
2011	8337.3	1400	70.4	82.6	69.1	81.9	68.0	78.0	7313	83.5
2012	8438.9	1400	70.1	82.1	69.1	81.3	68.6	77.5	6571	74.8
2013	9439.4	1400	78.8	81.9	77.6	81.2	77.0	77.5	7186	82.0
2014	9215.5	1400	77.3	81.8	75.1	80.9	75.1	77.4	7083	80.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		95			488	
B. Refuelling without a maintenance				4	0	
C. Inspection, maintenance or repair combined with refuelling	1403	179		552	15	
D. Inspection, maintenance or repair without refuelling				23		
E. Testing of plant systems or components				0		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				72		
H. Nuclear regulatory requirements					39	
L. Human factor related					8	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					19	
Z. Other					18	
Subtotal	1403	274	0	651	587	0
Total		1677			1238	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		88
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems		3
14. Safety Systems		26
15. Reactor Cooling Systems		18
31. Turbine and auxiliaries	95	259
32. Feedwater and Main Steam System		59
33. Circulating Water System		2
35. All other I&C Systems		0
41. Main Generator Systems		13
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		2
Total	95	483



# SE-4 RINGHALS-1

Operator: RAB (Ringhals AB)

Contractor: ABBATOM (ABBATOM (formerly ASEA-ATOM))

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 878.0 MW(e)  
 Design Net Capacity: 760.0 MW(e)  
 Design Discharge Burnup: 41000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5485.1 GW(e)·h  
 Energy Availability Factor: 70.7%  
 Load Factor: 71.3%  
 Operating Factor: 73.6%  
 Energy Unavailability Factor: 29.3%  
 Total Off-line Time: 2311 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	653.8	590.9	458.6	0.0	0.0	103.5	537.2	633.8	621.2	642.5	628.4	615.4	5485.1
EAF (%)	100.0	100.0	70.1	0.0	0.0	16.0	81.0	95.8	97.0	97.1	98.2	94.0	70.7
UCF (%)	100.0	100.0	70.1	0.0	0.0	16.9	85.4	100.0	100.0	99.4	99.8	94.0	72.1
LF (%)	100.1	100.1	70.2	0.0	0.0	16.4	82.2	97.0	98.3	98.4	99.4	94.2	71.3
OF (%)	100.0	100.0	71.1	0.0	0.0	27.1	89.9	100.0	100.0	100.0	100.0	95.7	73.6
EUf (%)	0.0	0.0	29.9	100.0	100.0	84.0	19.0	4.2	3.0	2.9	1.8	6.0	29.3
PUf (%)	0.0	0.0	29.9	100.0	100.0	46.7	0.0	0.0	0.0	0.6	0.0	0.0	23.1
UCLF (%)	0.0	0.0	0.0	0.0	0.0	36.4	14.6	0.0	0.0	0.0	0.2	6.0	4.8
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.8	4.4	4.2	3.0	2.3	1.6	0.0	1.4

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

20/7 REACTOR SCRAM DUE TO HUMAN FACTOR, COOLING SYSTEM TO THE CONDENSOR ON ONE TURBINE WAS STOPPED.25/12 REACTOR SCRAM DUE TO FAULT IN TURBINEREGULATORSYSTEM I ONE TURBINE.

## 5. Historical Summary

Date of Construction Start: 01 Feb 1969      Lifetime Generation: 185974.6 GW(e)·h  
 Date of First Criticality: 20 Aug 1973      Cumulative Energy Availability Factor: 68.9%  
 Date of Grid Connection: 14 Oct 1974      Cumulative Load Factor: 67.3%  
 Date of Commercial Operation: 01 Jan 1976      Cumulative Unit Capability Factor: 69.9%  
    Cumulative Energy Unavailability Factor: 31.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1976	2164.6	760	32.4	32.4	32.4	32.4	32.4	32.4	4269	48.6
1977	3531.2	760	53.0	42.7	53.0	42.7	53.0	42.7	6095	69.6
1978	4153.1	750	63.2	49.5	63.2	49.5	63.2	49.5	6099	69.6
1979	3868.2	750	58.9	51.8	58.9	51.8	58.9	51.8	6070	69.3
1980	4433.8	750	68.8	55.2	68.2	55.1	67.3	54.9	6362	72.4
1981	4059.4	750	61.8	56.3	61.8	56.2	61.8	56.0	6285	71.7
1982	4687.5	750	74.9	58.9	74.9	58.8	71.3	58.2	7162	81.8
1983	3265.0	750	49.7	57.8	49.7	57.7	49.7	57.2	5372	61.3
1984	4917.7	750	79.8	60.2	79.7	60.1	74.6	59.1	7382	84.0
1985	5168.8	750	86.0	62.8	86.0	62.7	78.7	61.0	7832	89.4
1986	4470.5	750	69.9	63.4	69.9	63.4	68.0	61.7	7203	82.2
1987	4872.7	750	77.7	64.6	77.7	64.6	74.2	62.7	7878	89.9
1988	4694.7	750	75.1	65.4	74.7	65.3	71.3	63.4	7338	83.5
1989	4855.3	755	81.8	66.6	81.8	66.5	73.4	64.1	7963	90.9
1990	4525.6	795	71.6	66.9	71.4	66.9	65.0	64.2	7918	90.4
1991	5638.9	795	82.6	68.0	82.5	67.9	81.0	65.3	8034	91.7
1992	3383.8	795	51.2	66.9	51.2	66.9	48.5	64.2	4938	56.2
1993	3996.4	795	68.5	67.0	68.5	67.0	57.4	63.8	6575	75.1
1994	5389.2	795	78.0	67.6	76.4	67.5	77.4	64.6	7189	82.1
1995	5667.0	826	78.3	68.2	78.2	68.1	78.3	65.3	7697	87.9
1996	6490.9	832	90.3	69.3	90.1	69.2	88.7	66.5	8008	91.2
1997	2236.3	830	32.9	67.6	30.5	67.3	30.8	64.8	3022	34.5

1998	5601.6	830	84.8	68.4	80.7	67.9	77.0	65.3	7605	86.8
1999	4930.4	825	73.3	68.6	68.4	67.9	68.2	65.5	6500	74.2
2000	3239.7	825	57.2	68.1	50.8	67.2	44.7	64.6	4659	53.0
2001	5835.0	825	86.1	68.8	86.1	68.0	80.7	65.2	7814	89.2
2002	5956.2	830	84.7	69.5	80.4	68.5	81.9	65.9	7667	87.5
2003	5104.3	830	70.4	69.5	70.2	68.5	70.2	66.1	6269	71.6
2004	6523.1	830	90.1	70.2	89.7	69.3	89.5	66.9	7974	90.8
2005	6064.8	830	83.9	70.7	83.5	69.8	83.4	67.5	7452	85.1
2006	6518.8	843	89.9	71.4	87.9	70.4	88.3	68.2	7982	91.1
2007	5963.4	843	81.1	71.7	79.4	70.7	80.8	68.6	7275	83.0
2008	4552.7	856	62.1	71.4	60.6	70.4	60.5	68.4	5480	62.4
2009	1314.3	856	17.4	69.7	17.4	68.7	17.5	66.8	1639	18.7
2010	3587.6	855	48.8	69.0	47.5	68.1	47.9	66.2	4518	51.6
2011	5971.2	854	81.7	69.4	80.0	68.4	79.8	66.6	7377	84.2
2012	5529.6	865	72.5	69.5	72.1	68.5	72.8	66.8	7322	83.4
2013	6120.6	878	80.6	69.8	79.0	68.8	79.6	67.1	7842	89.5
2014	5485.1	878	72.1	69.9	70.7	68.9	71.3	67.3	6449	73.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		325			816	1
C. Inspection, maintenance or repair combined with refuelling	1941			1041	32	
D. Inspection, maintenance or repair without refuelling				26		
E. Testing of plant systems or components					4	
H. Nuclear regulatory requirements					11	
J. Grid limitation, failure or grid unavailability						3
L. Human factor related		43			4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					9	
Z. Other					26	8
Subtotal	1941	368	0	1067	902	12
Total		2309			1981	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		240
12. Reactor I&C Systems		77
13. Reactor Auxiliary Systems	31	23
14. Safety Systems	262	258
15. Reactor Cooling Systems		94
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries	32	37
32. Feedwater and Main Steam System		35
35. All other I&C Systems		4
41. Main Generator Systems		0
42. Electrical Power Supply Systems		10
XX. Miscellaneous Systems		35
Total	325	813

## SE-5 RINGHALS-2

Operator: RAB (Ringhals AB)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 807.0 MW(e)  
 Design Net Capacity: 820.0 MW(e)  
 Design Discharge Burnup: 47000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 4321.6 GW(e)·h  
 Energy Availability Factor: 60.9%  
 Load Factor: 61.1%  
 Operating Factor: 62.1%  
 Energy Unavailability Factor: 39.1%  
 Total Off-line Time: 3317 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	601.4	544.0	601.0	579.8	592.0	565.5	568.9	269.1	0.0	0.0	0.0	0.0	4321.6
EAF (%)	100.0	100.0	100.0	99.4	98.2	97.0	94.2	44.4	0.0	0.0	0.0	0.0	60.9
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	47.3	0.0	0.0	0.0	0.0	62.1
LF (%)	100.2	100.3	100.1	99.8	98.6	97.3	94.7	44.8	0.0	0.0	0.0	0.0	61.1
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	47.7	0.0	0.0	0.0	0.0	62.1
EUAF (%)	0.0	0.0	0.0	0.6	1.8	3.0	5.8	55.6	100.0	100.0	100.0	100.0	39.1
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.7	100.0	0.0	0.0	0.0	12.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	25.2
XUF (%)	0.0	0.0	0.0	0.6	1.8	3.0	5.8	2.9	0.0	0.0	0.0	0.0	1.2

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

UNPLANNED EXTENSION OF FULL PLANNED OUTAGE, DUE TO SMALL LEAKAGE IN STEEL SHIELD TO CONTAINMENT, DETECTED UNDER CONTAINMENT AIR TEST

### 5. Historical Summary

Date of Construction Start: 01 Oct 1970      Lifetime Generation: 197177.0 GW(e)·h  
 Date of First Criticality: 19 Jun 1974      Cumulative Energy Availability Factor: 69.2%  
 Date of Grid Connection: 17 Aug 1974      Cumulative Load Factor: 67.4%  
 Date of Commercial Operation: 01 May 1975      Cumulative Unit Capability Factor: 70.9%  
    Cumulative Energy Unavailability Factor: 30.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	2162.0	820	44.9	44.9	44.9	44.9	44.8	44.8	3382	57.5
1976	4213.0	822	59.4	53.6	59.4	53.6	58.3	52.9	6167	70.2
1977	4114.4	822	57.1	54.9	57.1	54.9	57.1	54.5	6402	73.1
1978	4094.4	800	58.4	55.8	58.4	55.8	58.4	55.6	6772	77.3
1979	3585.3	800	51.2	54.9	51.2	54.9	51.2	54.6	5541	63.3
1980	4336.9	800	61.7	56.1	61.7	56.1	61.7	55.9	5824	66.3
1981	4093.2	800	58.4	56.4	58.4	56.4	58.4	56.2	6216	71.0
1982	4548.0	800	66.3	57.7	66.3	57.7	64.9	57.4	5922	67.6
1983	3935.3	800	56.2	57.5	56.2	57.5	56.2	57.2	6107	69.7
1984	4178.7	800	68.3	58.6	68.2	58.6	59.5	57.5	6090	69.3
1985	4294.7	800	74.8	60.1	74.8	60.1	61.3	57.8	6680	76.3
1986	3969.1	800	59.4	60.1	59.4	60.1	56.6	57.7	6383	72.9
1987	4216.6	800	65.2	60.5	65.2	60.5	60.2	57.9	7397	84.4
1988	4216.1	800	68.5	61.1	68.5	61.0	60.0	58.1	7368	83.9
1989	3619.6	800	50.0	60.3	50.0	60.3	51.6	57.6	6002	68.5
1990	5064.8	800	66.7	60.7	66.7	60.7	72.3	58.6	6348	72.5
1991	6232.8	875	83.5	62.2	83.5	62.2	81.3	60.0	7909	90.3
1992	5193.4	875	72.1	62.8	72.1	62.8	67.6	60.5	6959	79.2
1993	2650.0	875	37.8	61.4	37.8	61.4	34.6	59.0	3307	37.8
1994	6258.7	875	84.7	62.6	83.0	62.5	81.7	60.2	7429	84.8
1995	6096.6	867	85.6	63.8	84.8	63.7	80.3	61.3	7676	87.6
1996	5723.3	864	84.6	64.8	76.8	64.3	75.4	61.9	7574	86.2

1997	6175.1	864	90.4	66.0	80.7	65.1	81.6	62.8	7927	90.5
1998	6096.4	875	90.5	67.1	82.2	65.8	79.5	63.6	7866	89.8
1999	6445.8	862	92.2	68.1	85.8	66.7	85.4	64.5	8075	92.2
2000	5143.5	862	84.8	68.8	77.0	67.1	67.9	64.7	7284	82.9
2001	6322.7	862	87.0	69.5	85.7	67.8	83.7	65.4	8004	91.4
2002	6540.3	875	89.2	70.3	84.3	68.4	85.3	66.2	8130	92.8
2003	6811.5	875	92.5	71.1	90.9	69.3	88.9	67.0	8093	92.4
2004	6786.6	875	90.3	71.8	90.3	70.0	88.3	67.7	7976	90.8
2005	5784.4	875	78.4	72.0	77.9	70.3	75.5	68.0	6874	78.5
2006	6839.4	867	91.7	72.6	89.7	70.9	90.1	68.7	8107	92.5
2007	6365.1	867	85.2	73.0	83.7	71.3	83.8	69.2	7782	88.8
2008	5746.3	867	79.9	73.2	78.1	71.5	75.5	69.4	7175	81.7
2009	2786.3	813	39.1	72.3	38.6	70.6	39.1	68.5	3432	39.2
2010	5599.9	813	80.4	72.5	78.3	70.8	78.6	68.8	7164	81.8
2011	1726.7	809	24.9	71.3	24.4	69.6	24.4	67.6	2186	25.0
2012	3613.0	865	49.8	70.7	48.2	69.0	48.3	67.1	4660	53.1
2013	6297.9	807	86.4	71.1	84.8	69.4	85.0	67.6	7978	91.1
2014	4321.6	807	62.1	70.9	60.9	69.2	61.1	67.4	5443	62.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2208			701	
C. Inspection, maintenance or repair combined with refuelling	1109			967	1	
D. Inspection, maintenance or repair without refuelling				67		
E. Testing of plant systems or components				2	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				79	50	
H. Nuclear regulatory requirements					3	
J. Grid limitation, failure or grid unavailability						10
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						5
L. Human factor related					2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
P. Fire					72	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						0
Z. Other					0	
Subtotal	1109	2208	0	1115	829	16
Total		3317			1960	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		248
12. Reactor I&C Systems		11
14. Safety Systems	2208	118
15. Reactor Cooling Systems		14
16. Steam generation systems		191
31. Turbine and auxiliaries		14
32. Feedwater and Main Steam System		30
33. Circulating Water System		0
35. All other I&C Systems		0

41. Main Generator Systems		29
42. Electrical Power Supply Systems		42
Total	2208	697

## SE-7 RINGHALS-3

Operator: RAB (Ringhals AB)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1064.0 MW(e)

Design Net Capacity: 915.0 MW(e)

Design Discharge Burnup: 46000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8099.9 GW(e)·h

Energy Availability Factor: 86.2%

Load Factor: 87.0%

Operating Factor: 90.0%

Energy Unavailability Factor: 13.8%

Total Off-line Time: 873 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	793.1	718.9	757.8	760.3	323.1	239.8	692.4	749.6	740.1	773.8	758.8	792.2	8099.9
EAF (%)	100.0	100.0	95.8	98.3	40.3	30.4	86.5	93.7	95.7	96.8	98.1	99.8	86.2
UCF (%)	100.0	100.0	95.8	100.0	41.4	32.8	94.9	99.9	100.0	100.0	100.0	99.8	88.7
LF (%)	100.2	100.5	95.7	99.2	40.8	31.3	87.5	94.9	96.8	97.9	99.2	100.3	87.0
OF (%)	100.0	100.0	100.0	100.0	42.3	38.3	100.0	100.0	100.0	100.0	100.0	100.0	90.0
EUf (%)	0.0	0.0	4.2	1.7	59.7	69.6	13.5	6.3	4.3	3.2	1.9	0.2	13.8
PUf (%)	0.0	0.0	0.0	0.0	58.6	65.3	0.0	0.0	0.0	0.0	0.0	0.0	10.3
UCLF (%)	0.0	0.0	4.2	0.0	0.0	2.0	5.1	0.1	0.0	0.0	0.0	0.2	1.0
XUF (%)	0.0	0.0	0.0	1.7	1.1	2.4	8.3	6.2	4.3	3.2	1.9	0.0	2.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

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### 5. Historical Summary

Date of Construction Start: 01 Sep 1972      Lifetime Generation: 212958.8 GW(e)·h

Date of First Criticality: 29 Jul 1980      Cumulative Energy Availability Factor: 78.1%

Date of Grid Connection: 07 Sep 1980      Cumulative Load Factor: 76.1%

Date of Commercial Operation: 09 Sep 1981      Cumulative Unit Capability Factor: 80.0%

Cumulative Energy Unavailability Factor: 21.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	721.0	920	26.7	26.7	26.7	26.7	26.8	26.8	864	29.5
1982	1251.6	915	15.6	18.4	15.6	18.4	15.6	18.4	3680	42.0
1983	2909.9	867	38.2	26.7	38.2	26.7	38.2	26.7	5886	67.2
1984	5346.6	915	72.4	40.6	72.4	40.6	66.5	38.8	6450	73.4
1985	6090.3	915	84.8	50.9	84.8	50.9	76.0	47.5	7580	86.5
1986	6233.9	915	78.8	56.2	78.8	56.2	77.8	53.2	7026	80.2
1987	6169.2	915	83.1	60.5	83.1	60.5	77.0	57.0	7485	85.4
1988	6151.2	915	77.1	62.8	77.1	62.8	76.5	59.7	7645	87.0
1989	5829.7	915	82.6	65.2	82.6	65.2	72.7	61.3	7757	88.6
1990	5871.3	915	74.2	66.1	74.0	66.1	73.2	62.5	7855	89.7
1991	5923.6	915	75.7	67.1	75.7	67.0	73.9	63.6	8007	91.4
1992	5622.1	915	82.3	68.4	82.3	68.4	69.9	64.2	7941	90.4
1993	6685.8	915	89.8	70.1	89.8	70.1	83.4	65.8	7964	90.9
1994	6873.4	918	86.1	71.4	86.1	71.3	85.5	67.3	8097	92.4
1995	4873.6	918	60.7	70.6	60.7	70.6	60.6	66.8	6040	68.9
1996	6816.8	910	92.5	72.0	87.3	71.7	85.3	68.0	8166	93.0
1997	6581.4	910	85.5	72.9	81.7	72.3	82.6	68.9	8107	92.5
1998	6382.6	915	90.2	73.9	81.3	72.8	79.6	69.5	8008	91.4
1999	6976.0	911	90.0	74.7	88.0	73.6	87.4	70.5	7899	90.2
2000	6165.8	911	92.3	75.6	89.5	74.5	77.1	70.8	7966	90.7
2001	6285.3	911	88.6	76.3	79.4	74.7	78.8	71.2	7942	90.7
2002	6890.6	915	90.8	77.0	88.8	75.4	86.0	71.9	7930	90.5
2003	6714.6	915	85.3	77.3	84.4	75.8	83.8	72.4	7475	85.3

2004	7497.9	915	94.0	78.1	93.9	76.6	93.3	73.3	8295	94.4
2005	7181.6	915	91.2	78.6	90.5	77.1	89.6	74.0	8075	92.2
2006	6570.8	917	81.8	78.7	75.0	77.0	76.4	74.1	7249	82.8
2007	5990.8	1045	67.0	78.2	64.3	76.5	65.4	73.7	6565	74.9
2008	7599.8	985	89.2	78.7	87.8	76.9	87.8	74.3	7980	90.8
2009	8102.9	1044	91.4	79.2	89.7	77.4	89.8	74.9	8093	92.4
2010	7605.5	1051	84.0	79.3	81.9	77.6	82.6	75.2	7590	86.6
2011	7141.6	1057	79.5	79.3	77.2	77.6	77.1	75.3	7032	80.3
2012	8327.8	1064	91.4	79.8	89.2	78.0	89.6	75.8	8088	92.1
2013	6950.0	1064	77.0	79.7	73.8	77.9	74.6	75.7	6852	78.2
2014	8099.9	1062	88.7	80.0	86.2	78.1	87.0	76.1	7887	90.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					327	
C. Inspection, maintenance or repair combined with refuelling	873			685	18	
D. Inspection, maintenance or repair without refuelling				223		
E. Testing of plant systems or components				5	1	
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						4
L. Human factor related					4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other					2	
Subtotal	873	0	0	913	352	7
Total	873			1272		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		26
12. Reactor I&C Systems		3
14. Safety Systems		28
15. Reactor Cooling Systems		45
16. Steam generation systems		135
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		41
32. Feedwater and Main Steam System		13
41. Main Generator Systems		11
42. Electrical Power Supply Systems		19
Total	0	323

## SE-10 RINGHALS-4

Operator: RAB (Ringhals AB)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 940.0 MW(e)

Design Net Capacity: 915.0 MW(e)

Design Discharge Burnup: 46000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6740.4 GW(e)·h

Energy Availability Factor: 81.5%

Load Factor: 81.9%

Operating Factor: 84.4%

Energy Unavailability Factor: 18.5%

Total Off-line Time: 1364 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	699.0	633.2	697.0	668.0	677.4	630.3	641.4	93.0	0.0	634.9	668.2	698.1	6740.4
EAF (%)	100.0	100.0	100.0	97.7	96.0	92.2	90.9	13.3	0.0	90.0	97.9	100.0	81.5
UCF (%)	100.0	100.0	100.0	100.0	100.0	97.9	100.0	16.7	0.0	93.5	100.0	100.0	84.0
LF (%)	100.0	100.2	99.7	98.7	96.9	93.1	91.7	13.3	0.0	91.0	98.9	100.0	81.9
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	16.9	0.0	96.5	100.0	100.0	84.4
EUf (%)	0.0	0.0	0.0	2.3	4.0	7.8	9.1	86.7	100.0	10.0	2.1	0.0	18.5
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	83.3	98.5	2.1	0.0	0.0	15.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	1.5	4.4	0.0	0.0	0.7
XUF (%)	0.0	0.0	0.0	2.3	4.0	5.7	9.1	3.3	0.0	3.5	2.1	0.0	2.5

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

REACTOR SCRAM 30/9 DUE TO LOW LEVEL IN STEAM GENERATOR 3, UNDER STARTUP. REACTOR SCRAM 1/10 DUE TO HIGH LEVEL IN STEAM GENERATOR 2.

### 5. Historical Summary

Date of Construction Start: 01 Nov 1973      Lifetime Generation: 202844.2 GW(e)·h

Date of First Criticality: 19 May 1982      Cumulative Energy Availability Factor: 83.7%

Date of Grid Connection: 23 Jun 1982      Cumulative Load Factor: 80.0%

Date of Commercial Operation: 21 Nov 1983      Cumulative Unit Capability Factor: 85.8%

Cumulative Energy Unavailability Factor: 16.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	879.6	915	65.7	65.7	65.7	65.7	65.7	65.7	1275	87.1
1984	5987.7	915	82.3	79.9	82.2	79.8	74.5	73.2	7517	85.6
1985	5923.7	915	87.9	83.6	87.9	83.6	73.9	73.5	7755	88.5
1986	5619.3	915	70.7	79.5	70.7	79.5	70.1	72.5	6839	78.1
1987	5665.9	915	88.2	81.6	88.2	81.6	70.7	72.0	7827	89.3
1988	6641.7	915	83.4	82.0	83.4	81.9	82.6	74.1	7945	90.4
1989	5536.8	915	85.8	82.6	85.8	82.6	69.1	73.3	7624	87.0
1990	6467.3	915	89.1	83.5	89.1	83.5	80.7	74.3	8080	92.2
1991	6916.2	915	85.9	83.8	85.9	83.8	86.3	75.8	8041	91.8
1992	6432.4	915	90.1	84.5	90.0	84.5	80.0	76.2	8156	92.9
1993	6342.3	915	88.8	84.9	88.8	84.9	79.1	76.5	7906	90.3
1994	6234.7	914	84.8	84.9	84.8	84.9	77.9	76.6	7476	85.3
1995	6251.7	912	88.4	85.2	80.6	84.5	78.3	76.8	7684	87.7
1996	6426.8	912	91.8	85.7	79.6	84.1	80.2	77.0	8067	91.8
1997	6372.3	912	87.0	85.8	78.8	83.8	79.8	77.2	7665	87.5
1998	6809.8	915	92.5	86.2	86.5	84.0	85.0	77.7	8146	93.0
1999	6986.8	907	91.7	86.6	88.6	84.2	87.9	78.4	8042	91.8
2000	4060.7	907	66.5	85.4	63.4	83.0	51.0	76.8	5898	67.1
2001	6624.0	909	88.4	85.6	86.5	83.2	83.2	77.1	7758	88.6
2002	5942.2	915	80.2	85.3	75.5	82.8	74.1	77.0	7056	80.5
2003	6996.5	915	89.2	85.5	88.9	83.1	87.3	77.5	7843	89.5
2004	7209.6	915	92.1	85.8	92.1	83.5	89.7	78.1	8092	92.1



2005	7129.8	915	91.5	86.0	91.4	83.9	89.0	78.6	8073	92.2
2006	7092.4	907	91.2	86.3	88.7	84.1	89.3	79.0	8054	91.9
2007	7192.9	907	91.0	86.5	89.4	84.3	90.5	79.5	8126	92.8
2008	7331.9	935	91.1	86.6	89.0	84.5	89.3	79.9	8046	91.6
2009	7467.7	936	92.8	86.9	90.2	84.7	91.1	80.3	8165	93.2
2010	7229.5	935	89.6	87.0	87.3	84.8	88.3	80.6	7948	90.7
2011	4102.4	945	50.7	85.7	50.1	83.6	49.6	79.5	4678	53.4
2012	6963.0	940	85.5	85.7	83.6	83.6	84.0	79.6	7541	85.8
2013	7379.3	940	91.4	85.9	88.9	83.7	89.6	80.0	8054	91.9
2014	6740.4	938	84.0	85.8	81.5	83.7	81.9	80.0	7396	84.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					186	1
C. Inspection, maintenance or repair combined with refuelling	1332			767	0	
D. Inspection, maintenance or repair without refuelling				182		
E. Testing of plant systems or components				33	14	
H. Nuclear regulatory requirements					2	
J. Grid limitation, failure or grid unavailability						0
L. Human factor related		33			3	
Z. Other				1	13	
Subtotal	1332	33	0	983	218	1
Total		1365			1202	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		54
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		17
14. Safety Systems		0
15. Reactor Cooling Systems		65
16. Steam generation systems		26
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		19
Total	0	184

**CH-1 BEZNAU-1****Operator:** Axpo AG (Kernkraftwerk Beznau)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 365.0 MW(e)

**Design Net Capacity:** 350.0 MW(e)

**Design Discharge Burnup:** 42000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 2920.6 GW(e)·h

**Energy Availability Factor:** 91.6%

**Load Factor:** 91.3%

**Operating Factor:** 91.9%

**Energy Unavailability Factor:** 8.4%

**Total Off-line Time:** 713 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	274.0	247.3	273.2	144.4	271.7	122.2	254.0	267.2	259.8	270.0	263.7	273.3	2920.6
<b>EAF (%)</b>	100.0	100.0	100.0	55.5	100.0	47.7	95.4	100.0	100.0	100.0	100.0	100.0	91.6
<b>UCF (%)</b>	100.0	100.0	100.0	55.5	100.0	47.7	95.4	100.0	100.0	100.0	100.0	100.0	91.6
<b>LF (%)</b>	100.9	100.8	100.7	55.0	100.0	46.5	93.5	98.4	98.8	99.3	100.3	100.6	91.3
<b>OF (%)</b>	100.0	100.0	100.0	56.9	100.0	48.5	95.7	100.0	100.0	100.0	100.0	100.0	91.9
<b>EUf (%)</b>	0.0	0.0	0.0	44.5	0.0	52.3	4.6	0.0	0.0	0.0	0.0	0.0	8.4
<b>PUf (%)</b>	0.0	0.0	0.0	42.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5
<b>UCLF (%)</b>	0.0	0.0	0.0	2.2	0.0	52.3	4.6	0.0	0.0	0.0	0.0	0.0	4.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

OPERATION AT FULL POWER IN BASE LOAD MODE.

**5. Historical Summary**

**Date of Construction Start:** 01 Sep 1965 **Lifetime Generation:** 118803.0 GW(e)·h

**Date of First Criticality:** 30 Jun 1969 **Cumulative Energy Availability Factor:** 85.1%

**Date of Grid Connection:** 17 Jul 1969 **Cumulative Load Factor:** 84.6%

**Date of Commercial Operation:** 01 Sep 1969 **Cumulative Unit Capability Factor:** 85.4%

**Cumulative Energy Unavailability Factor:** 14.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1969			Data not provided							
1970	1947.0	364	61.1	61.1	61.1	61.1	61.1	61.1	5917	67.5
1971	1700.5	364	59.0	60.0	59.0	60.0	53.3	57.2	5123	58.5
1972	1402.9	280	61.3	60.4	61.3	60.4	57.0	57.2	5391	61.4
1973	1655.0	350	71.6	63.3	71.6	63.3	54.0	56.3	6654	76.0
1974	2346.7	350	78.1	66.3	78.1	66.3	76.5	60.5	7177	81.9
1975	2490.9	350	81.2	68.8	81.2	68.8	81.2	64.0	7490	85.5
1976	2548.1	350	83.5	71.0	83.5	71.0	82.9	66.8	7530	85.7
1977	2596.3	350	85.2	72.8	85.2	72.8	84.7	69.0	7592	86.7
1978	2761.9	350	89.5	74.7	89.5	74.7	90.1	71.4	8031	91.7
1979	2658.8	350	86.1	75.8	86.1	75.8	86.7	72.9	7746	88.4
1980	2650.5	350	85.7	76.7	85.7	76.7	86.2	74.2	7682	87.5
1981	2569.7	350	83.5	77.3	83.5	77.3	83.8	75.0	7486	85.5
1982	2566.9	350	83.5	77.8	83.5	77.8	83.7	75.7	7553	86.2
1983	2551.7	350	83.5	78.2	83.5	78.2	83.2	76.2	7546	86.1
1984	2732.9	350	88.8	78.9	88.8	78.9	88.9	77.1	8001	91.1
1985	2634.3	350	86.0	79.4	86.0	79.4	85.9	77.6	7906	90.3
1986	2496.3	350	81.6	79.5	81.6	79.5	81.4	77.8	7403	84.5
1987	2486.3	350	80.7	79.6	80.7	79.6	81.1	78.0	7256	82.8
1988	2566.5	350	83.0	79.7	83.0	79.7	83.5	78.3	7499	85.4
1989	2433.1	350	78.6	79.7	78.6	79.7	79.4	78.4	7062	80.6
1990	2562.5	350	84.4	79.9	84.4	79.9	83.6	78.6	7506	85.7
1991	2495.3	350	83.5	80.1	83.5	80.1	81.4	78.7	7430	84.8

1992	2477.4	350	81.7	80.1	81.7	80.1	80.6	78.8	7303	83.1
1993	2158.4	350	69.9	79.7	69.4	79.7	70.4	78.5	6241	71.2
1994	2686.9	350	86.2	80.0	85.1	79.9	87.6	78.8	7610	86.9
1995	2850.5	350	90.5	80.4	90.2	80.3	93.0	79.4	7993	91.2
1996	2753.2	353	87.5	80.6	86.8	80.5	88.6	79.7	7704	87.7
1997	2708.2	365	87.5	80.9	85.1	80.7	84.7	79.9	7731	88.3
1998	3183.1	365	99.9	81.6	99.8	81.4	99.6	80.6	8760	100.0
1999	2841.3	365	91.3	81.9	88.6	81.7	88.9	80.9	8074	92.2
2000	2539.2	365	79.2	81.8	78.3	81.5	79.2	80.8	7113	81.0
2001	3090.2	365	96.8	82.3	96.8	82.0	96.6	81.4	8504	97.1
2002	2908.8	365	91.3	82.6	91.0	82.3	91.0	81.7	8000	91.3
2003	3061.8	365	96.9	83.0	96.2	82.7	95.8	82.1	8494	97.0
2004	2801.2	365	87.5	83.2	87.4	82.9	87.4	82.3	7758	88.3
2005	3096.0	365	96.7	83.6	96.6	83.3	96.8	82.7	8491	96.9
2006	2950.7	365	92.3	83.8	92.2	83.5	92.3	82.9	8114	92.6
2007	3081.3	365	96.7	84.1	96.7	83.9	96.4	83.3	8486	96.9
2008	2956.6	365	92.5	84.4	92.5	84.1	92.2	83.5	8143	92.7
2009	3067.3	365	96.3	84.7	96.3	84.4	95.9	83.9	8460	96.6
2010	2674.0	365	83.7	84.6	83.7	84.4	83.6	83.9	7347	83.9
2011	3067.1	365	96.4	84.9	96.4	84.7	95.9	84.1	8458	96.6
2012	2724.7	365	85.3	84.9	85.3	84.7	85.0	84.2	7508	85.5
2013	3078.4	365	96.6	85.2	96.6	85.0	96.3	84.5	8473	96.7
2014	2920.6	365	91.6	85.4	91.6	85.1	91.3	84.6	8047	91.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		419			208	
B. Refuelling without a maintenance	294			39		
C. Inspection, maintenance or repair combined with refuelling				867		
D. Inspection, maintenance or repair without refuelling				15		
E. Testing of plant systems or components					0	
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Subtotal	294	419	0	921	208	1
Total		713			1130	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems		80
13. Reactor Auxiliary Systems	387	2
14. Safety Systems		3
15. Reactor Cooling Systems		10
16. Steam generation systems	32	78
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		11
35. All other I&C Systems		0
42. Electrical Power Supply Systems		0
Total	419	204

## CH-3 BEZNAU-2

Operator: Axpo AG (Kernkraftwerk Beznau)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 365.0 MW(e)  
 Design Net Capacity: 350.0 MW(e)  
 Design Discharge Burnup: 42000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3053.5 GW(e)·h  
 Energy Availability Factor: 96.0%  
 Load Factor: 95.5%  
 Operating Factor: 96.3%  
 Energy Unavailability Factor: 4.0%  
 Total Off-line Time: 327 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	272.7	246.3	269.0	262.5	271.1	258.2	266.6	142.9	259.3	269.3	263.1	272.4	3053.5
EAF (%)	100.0	100.0	98.9	100.0	100.0	100.0	100.0	53.9	100.0	100.0	100.0	100.0	96.0
UCF (%)	100.0	100.0	98.9	100.0	100.0	100.0	100.0	53.9	100.0	100.0	100.0	100.0	96.0
LF (%)	100.4	100.4	99.2	99.9	99.8	98.2	98.2	52.6	98.7	99.0	100.1	100.3	95.5
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	56.0	100.0	100.0	100.0	100.0	96.3
EUf (%)	0.0	0.0	1.1	0.0	0.0	0.0	0.0	46.1	0.0	0.0	0.0	0.0	4.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.7	0.0	0.0	0.0	0.0	3.9
UCLF (%)	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE.

### 5. Historical Summary

Date of Construction Start: 01 Jan 1968      Lifetime Generation: 117857.0 GW(e)·h  
 Date of First Criticality: 16 Oct 1971      Cumulative Energy Availability Factor: 87.5%  
 Date of Grid Connection: 23 Oct 1971      Cumulative Load Factor: 87.7%  
 Date of Commercial Operation: 01 Dec 1971      Cumulative Unit Capability Factor: 87.6%  
    Cumulative Energy Unavailability Factor: 12.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1971	174.9	340	94.6	94.6	94.6	94.6	80.8	80.8	690	92.7
1972	2618.5	364	82.7	83.5	82.7	83.5	81.9	81.8	7624	86.8
1973	2220.7	350	78.4	81.1	78.4	81.1	72.4	77.4	7042	80.4
1974	2527.8	350	83.5	81.9	83.5	81.9	82.4	79.0	7607	86.8
1975	2547.0	350	83.1	82.2	83.1	82.2	83.1	80.0	7503	85.7
1976	2652.2	350	86.6	83.0	86.6	83.0	86.3	81.2	7777	88.5
1977	2690.9	350	85.6	83.4	85.6	83.4	87.8	82.3	7758	88.6
1978	2753.1	350	86.7	83.9	86.7	83.9	89.8	83.3	7888	90.0
1979	2700.0	350	86.7	84.2	86.7	84.2	88.1	83.9	7835	89.4
1980	2559.0	350	81.0	83.9	81.0	83.9	83.2	83.9	7279	82.9
1981	2768.8	350	88.8	84.4	88.8	84.4	90.3	84.5	7868	89.8
1982	2722.1	350	87.6	84.7	87.6	84.7	88.8	84.9	7811	89.2
1983	2790.5	350	89.6	85.1	89.6	85.1	91.0	85.4	7977	91.1
1984	2724.2	350	87.5	85.3	87.5	85.3	88.6	85.6	7874	89.6
1985	2629.1	350	84.9	85.2	84.9	85.2	85.7	85.6	7647	87.3
1986	2769.8	350	90.2	85.6	90.2	85.6	90.3	85.9	7983	91.1
1987	2527.6	350	82.4	85.4	82.4	85.4	82.4	85.7	7535	86.0
1988	2630.2	350	84.5	85.3	84.5	85.3	85.6	85.7	7604	86.6
1989	2643.3	350	85.1	85.3	85.1	85.3	86.2	85.7	7614	86.9
1990	2636.1	350	85.3	85.3	85.3	85.3	86.0	85.8	7568	86.4
1991	2619.5	350	84.5	85.3	84.5	85.3	85.4	85.7	7551	86.2
1992	2375.9	350	76.3	84.8	76.3	84.8	77.3	85.3	6836	77.8
1993	2650.9	350	85.1	84.8	84.9	84.8	86.5	85.4	7517	85.8

1994	3062.8	350	98.9	85.5	98.8	85.4	99.9	86.0	8710	99.4
1995	2560.9	350	82.7	85.3	82.6	85.3	83.5	85.9	7247	82.7
1996	2754.1	351	88.5	85.5	87.9	85.4	89.1	86.0	7912	90.1
1997	3090.2	357	99.5	86.0	99.5	86.0	98.8	86.5	8732	99.7
1998	2717.8	357	87.8	86.1	87.3	86.0	86.9	86.6	7755	88.5
1999	2217.2	357	70.7	85.5	70.3	85.5	70.9	86.0	6322	72.2
2000	3071.0	365	96.2	85.9	96.2	85.8	95.8	86.3	8499	96.8
2001	2568.7	365	80.7	85.7	80.7	85.7	80.3	86.1	7107	81.1
2002	3012.0	365	94.6	86.0	94.6	86.0	94.2	86.4	8292	94.7
2003	2920.3	365	92.0	86.2	91.8	86.1	91.3	86.6	8070	92.1
2004	3099.4	365	97.0	86.6	97.0	86.5	96.7	86.9	8556	97.4
2005	2801.0	365	88.0	86.6	87.8	86.5	87.6	86.9	7728	88.2
2006	3073.2	365	97.1	86.9	96.8	86.8	96.1	87.2	8517	97.2
2007	2911.6	365	91.5	87.0	91.5	87.0	91.1	87.3	8063	92.0
2008	3073.4	365	96.2	87.3	96.2	87.2	95.9	87.5	8505	96.8
2009	2758.5	365	86.7	87.3	86.6	87.2	86.3	87.5	7615	86.9
2010	2856.5	365	89.6	87.3	89.6	87.3	89.3	87.5	7865	89.8
2011	2739.2	365	86.1	87.3	86.1	87.2	85.7	87.5	7564	86.3
2012	2794.0	365	87.7	87.3	87.7	87.2	87.1	87.5	7715	87.8
2013	2892.0	365	90.8	87.4	90.8	87.3	90.4	87.6	7968	91.0
2014	3053.5	365	96.0	87.6	96.0	87.5	95.5	87.7	8433	96.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					94	
B. Refuelling without a maintenance	327			32		
C. Inspection, maintenance or repair combined with refuelling				798		
D. Inspection, maintenance or repair without refuelling				32		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					1	
Subtotal	327	0	0	862	95	0
Total		327			957	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		0
14. Safety Systems		0
15. Reactor Cooling Systems		25
16. Steam generation systems		22
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		12
32. Feedwater and Main Steam System		3
33. Circulating Water System		3
35. All other I&C Systems		1
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		9
Total	0	88

## CH-4 GOESGEN

**Operator:** KKG (KERNKRAFTWERK GOESGEN-DAENIKEN AG)

**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 985.0 MW(e)  
**Design Net Capacity:** 920.0 MW(e)  
**Design Discharge Burnup:** 52000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 8021.6 GW(e)·h  
**Energy Availability Factor:** 90.8%  
**Load Factor:** 91.8%  
**Operating Factor:** 91.7%  
**Energy Unavailability Factor:** 9.2%  
**Total Off-line Time:** 731 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	748.4	682.3	751.6	725.0	746.9	166.7	512.0	741.1	717.2	745.4	728.5	756.5	8021.6
<b>EAF (%)</b>	98.8	100.0	100.0	100.0	100.0	23.8	68.7	98.7	98.8	100.0	100.0	100.0	90.8
<b>UCF (%)</b>	98.8	100.0	100.0	100.0	100.0	23.8	69.9	100.0	100.0	100.0	100.0	100.0	91.1
<b>LF (%)</b>	102.1	103.1	102.7	102.2	101.9	23.5	68.1	98.6	98.6	99.1	100.2	100.7	91.8
<b>OF (%)</b>	99.1	100.0	100.0	100.0	100.0	24.0	76.2	100.0	100.0	100.0	100.0	100.0	91.7
<b>EUf (%)</b>	1.2	0.0	0.0	0.0	0.0	76.2	31.3	1.3	1.2	0.0	0.0	0.0	9.2
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	76.2	29.9	0.0	0.0	0.0	0.0	0.0	8.8
<b>UCLF (%)</b>	1.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.3	1.2	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

POWER UPRATE TO 1010 MW SINCE JULY DUE TO REPLACEMENT OF THE LOW-PRESSURE TURBINE, CONDENSER AND GENERATOR. JANUARY: TURBINE SCRAM DUE TO VIBRATION PROTECTION TURBINE SHAFTJUNE: OUTAGE 30 DAYS WITH REPLACEMENT OF PARTS OF THE REACTOR CONTROL SYSTEM FOLLOWED BY LOAD TESTS DURING THE START UP AFTER THE OUTAGEJULY; UNPLANNED LOAD REDUCTION DUE TO A SIGNAL FROM THE REACTOR CONTROL SYSTEM .NO UNPLANNED SCRAM DURING THE YEAR.

### 5. Historical Summary

**Date of Construction Start:** 01 Dec 1973 **Lifetime Generation:** 256999.8 GW(e)·h  
**Date of First Criticality:** 20 Jan 1979 **Cumulative Energy Availability Factor:** 88.6%  
**Date of Grid Connection:** 02 Feb 1979 **Cumulative Load Factor:** 89.0%  
**Date of Commercial Operation:** 01 Nov 1979 **Cumulative Unit Capability Factor:** 89.4%  
**Cumulative Energy Unavailability Factor:** 11.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979	1255.5	924	93.2	93.2	93.2	93.2	93.2	93.2	1422	97.1
1980	5935.7	920	73.5	76.3	73.5	76.3	73.4	76.3	6819	77.6
1981	6527.6	920	80.7	78.3	80.7	78.3	81.0	78.4	7523	85.9
1982	6436.1	920	79.8	78.8	79.8	78.8	79.9	78.9	7665	87.5
1983	6891.6	920	86.2	80.6	86.2	80.6	85.5	80.5	7790	88.9
1984	7134.8	900	90.6	82.5	89.8	82.3	90.2	82.3	8015	91.2
1985	6747.7	909	85.7	83.0	84.6	82.7	84.7	82.7	7789	88.9
1986	6754.5	941	84.1	83.1	82.8	82.7	81.9	82.6	7386	84.3
1987	6910.3	935	85.2	83.4	84.4	82.9	84.4	82.8	7521	85.9
1988	6859.0	936	84.7	83.5	83.4	83.0	83.4	82.9	7476	85.1
1989	6878.7	931	85.4	83.7	84.3	83.1	84.3	83.0	7514	85.8
1990	7131.5	929	89.4	84.2	87.6	83.5	87.6	83.5	7983	91.1
1991	7141.9	925	89.7	84.7	88.1	83.9	88.1	83.8	7918	90.4
1992	7406.9	934	92.1	85.3	90.2	84.4	90.2	84.3	8107	92.3
1993	7408.1	950	89.3	85.5	88.9	84.7	89.0	84.7	8075	92.2
1994	7661.1	947	92.1	86.0	91.1	85.1	92.3	85.2	8102	92.5
1995	7820.9	971	91.8	86.4	91.1	85.5	91.9	85.6	8109	92.6
1996	7928.4	986	93.4	86.8	91.5	85.9	91.5	86.0	8204	93.4
1997	7967.8	986	93.5	87.2	91.6	86.2	92.2	86.4	8189	93.5

1998	7839.7	986	93.2	87.5	90.8	86.5	90.8	86.6	8179	93.4
1999	7533.9	970	89.9	87.6	88.7	86.6	88.7	86.7	7887	90.0
2000	7804.3	970	92.0	87.9	91.7	86.8	91.6	86.9	8089	92.1
2001	7870.5	970	93.5	88.1	92.6	87.1	92.6	87.2	8206	93.7
2002	7853.3	970	92.9	88.3	92.3	87.3	92.4	87.4	8154	93.1
2003	7988.7	970	94.5	88.6	93.9	87.6	94.0	87.7	8291	94.6
2004	8015.6	970	94.3	88.8	93.8	87.9	94.1	88.0	8300	94.5
2005	7588.2	970	88.4	88.8	88.0	87.9	89.3	88.0	7754	88.5
2006	8099.1	970	93.7	89.0	93.6	88.1	95.3	88.3	8230	93.9
2007	8158.9	970	94.8	89.2	94.6	88.3	96.0	88.6	8313	94.9
2008	7964.0	970	92.6	89.3	92.2	88.4	93.5	88.7	8148	92.8
2009	8072.4	970	94.2	89.5	94.0	88.6	95.0	89.0	8267	94.4
2010	8029.1	970	93.2	89.6	93.1	88.8	94.5	89.1	8220	93.8
2011	7910.3	970	92.0	89.7	92.0	88.9	93.1	89.3	8122	92.7
2012	8073.9	985	93.4	89.8	93.1	89.0	93.3	89.4	8281	94.3
2013	6410.2	985	73.4	89.3	73.4	88.5	74.3	88.9	6491	74.1
2014	8021.6	1010	91.1	89.4	90.8	88.6	91.8	89.0	8029	91.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1979 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		7			53	
C. Inspection, maintenance or repair combined with refuelling	723			751		
E. Testing of plant systems or components				0	0	
J. Grid limitation, failure or grid unavailability						0
Subtotal	723	7	0	751	53	0
Total		730			804	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1979 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		0
16. Steam generation systems		1
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		16
41. Main Generator Systems	7	27
Total	7	50

# CH-5 LEIBSTADT

Operator: KKL (KERNKRAFTWERK LEIBSTADT)

Contractor: GETSCO (GENERAL ELECTRIC TECHNICAL SERVICES CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1220.0 MW(e)  
 Design Net Capacity: 960.0 MW(e)  
 Design Discharge Burnup: 43000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9457.6 GW(e)·h  
 Energy Availability Factor: 88.5%  
 Load Factor: 88.5%  
 Operating Factor: 91.0%  
 Energy Unavailability Factor: 11.5%  
 Total Off-line Time: 790 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	907.2	816.6	900.7	866.5	890.0	847.4	816.9	246.1	500.7	888.6	869.6	907.5	9457.6
EAF (%)	99.9	99.6	99.4	98.6	98.0	96.5	90.0	27.1	57.0	97.8	99.0	100.0	88.5
UCF (%)	100.0	99.8	100.0	100.0	99.8	100.0	94.5	30.3	57.7	100.0	99.8	100.0	90.1
LF (%)	99.9	99.6	99.4	98.6	98.0	96.5	90.0	27.1	57.0	97.8	99.0	100.0	88.5
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	97.4	33.5	61.7	100.0	100.0	100.0	91.0
EUf (%)	0.1	0.4	0.6	1.4	2.0	3.5	10.0	72.9	43.0	2.2	1.0	0.0	11.5
PUf (%)	0.0	0.2	0.0	0.0	0.2	0.0	0.1	69.7	42.3	0.0	0.2	0.0	9.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.1	0.0	0.5
XUF (%)	0.0	0.2	0.6	1.3	1.8	3.5	4.5	3.2	0.7	2.2	0.8	0.0	1.6

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

SCRAM MISS OPC OF FLOW CTRL VALVE

## 5. Historical Summary

Date of Construction Start: 01 Jan 1974      Lifetime Generation: 247499.4 GW(e)·h  
 Date of First Criticality: 09 Mar 1984      Cumulative Energy Availability Factor: 85.6%  
 Date of Grid Connection: 24 May 1984      Cumulative Load Factor: 85.8%  
 Date of Commercial Operation: 15 Dec 1984      Cumulative Unit Capability Factor: 87.3%  
 Cumulative Energy Unavailability Factor: 14.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	0.7	1030	100.0	100.0	100.0	100.0	0.1	0.1	744	100.0
1985	6769.3	951	80.1	81.8	80.1	81.8	81.2	74.4	7233	82.6
1986	7209.2	957	83.2	82.5	83.2	82.5	85.9	79.9	7668	87.5
1987	7376.4	990	85.2	83.4	85.2	83.4	85.1	81.6	7917	90.4
1988	7003.5	990	80.0	82.5	80.0	82.5	80.5	81.4	7536	85.8
1989	7364.2	990	85.5	83.1	85.5	83.1	84.9	82.1	7671	87.6
1990	7596.2	990	89.9	84.3	89.9	84.3	87.6	83.0	7905	90.2
1991	7060.3	990	86.0	84.5	81.3	83.8	81.4	82.8	7580	86.5
1992	7537.6	990	90.4	85.2	86.4	84.2	86.7	83.2	7986	90.9
1993	7338.1	990	89.1	85.7	84.4	84.2	84.6	83.4	7898	90.2
1994	6988.2	1003	81.4	85.2	79.4	83.7	79.5	83.0	7108	81.1
1995	7673.8	1030	89.1	85.6	84.2	83.7	85.0	83.2	7819	89.3
1996	7705.1	1030	87.6	85.8	84.8	83.8	85.2	83.4	7734	88.0
1997	7762.5	1030	89.2	86.0	86.2	84.0	86.0	83.6	7830	89.4
1998	8046.2	1030	92.4	86.5	88.2	84.3	89.2	84.0	8102	92.5
1999	8320.0	1080	91.8	86.9	86.8	84.5	87.9	84.3	8126	92.8
2000	8823.2	1115	92.3	87.3	89.5	84.8	90.1	84.7	8159	92.9
2001	9089.8	1115	91.2	87.5	90.4	85.2	93.1	85.2	8187	93.5
2002	9173.8	1115	91.5	87.7	90.8	85.5	93.9	85.7	8250	94.2
2003	9309.3	1165	90.9	87.9	90.1	85.8	91.2	86.1	8204	93.6
2004	8692.0	1165	85.7	87.8	84.9	85.8	84.9	86.0	7633	86.9
2005	5768.1	1165	56.5	86.2	56.3	84.2	56.5	84.4	5004	57.1
2006	9367.0	1165	92.7	86.5	91.7	84.6	91.8	84.8	8206	93.7



2007	9436.8	1165	93.4	86.8	93.2	85.0	92.5	85.2	8276	94.5
2008	9307.6	1165	91.9	87.0	90.7	85.3	91.0	85.4	8119	92.4
2009	9385.0	1165	93.1	87.3	91.7	85.5	92.0	85.7	8203	93.6
2010	8774.5	1165	86.1	87.3	85.1	85.5	86.0	85.7	7640	87.2
2011	9481.3	1190	91.6	87.4	90.7	85.7	91.0	85.9	8094	92.4
2012	7881.3	1190	75.9	87.0	74.9	85.3	75.4	85.5	6746	76.8
2013	9691.7	1220	92.2	87.2	90.6	85.5	90.7	85.7	8150	93.0
2014	9457.6	1220	90.1	87.3	88.5	85.6	88.5	85.8	7970	91.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					185	
C. Inspection, maintenance or repair combined with refuelling	770			727		
D. Inspection, maintenance or repair without refuelling				14		
E. Testing of plant systems or components				0	1	
H. Nuclear regulatory requirements					1	
L. Human factor related		19			6	
Z. Other				2		
Subtotal	770	19	0	743	193	0
Total		789			936	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		30
12. Reactor I&C Systems		2
15. Reactor Cooling Systems		3
31. Turbine and auxiliaries		12
32. Feedwater and Main Steam System		5
35. All other I&C Systems		2
41. Main Generator Systems		128
XX. Miscellaneous Systems		0
Total	0	182

## CH-2 MUEHLEBERG

Operator: BKW (BKW ENERGIE AG)

Contractor: GETSCO (GENERAL ELECTRIC TECHNICAL SERVICES CO.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 373.0 MW(e)  
 Design Net Capacity: 306.0 MW(e)  
 Design Discharge Burnup: 48000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3014.6 GW(e)·h  
 Energy Availability Factor: 92.3%  
 Load Factor: 92.3%  
 Operating Factor: 93.0%  
 Energy Unavailability Factor: 7.7%  
 Total Off-line Time: 614 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	277.1	250.5	275.9	268.2	276.9	267.4	277.3	72.3	226.7	277.5	268.1	276.7	3014.6
EAF (%)	99.9	99.9	99.5	99.9	99.8	99.6	99.9	27.0	84.4	99.9	99.8	99.7	92.3
UCF (%)	99.9	100.0	99.6	99.9	99.8	99.6	99.9	27.0	84.5	99.9	99.9	99.7	92.4
LF (%)	99.9	99.9	99.5	99.8	99.8	99.6	99.9	26.1	84.4	99.9	99.8	99.7	92.3
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	29.0	88.1	100.0	100.0	100.0	93.0
EUf (%)	0.1	0.1	0.5	0.1	0.2	0.4	0.1	73.0	15.6	0.1	0.2	0.3	7.7
PUf (%)	0.1	0.1	0.4	0.1	0.2	0.4	0.1	73.0	15.5	0.1	0.2	0.3	7.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

ALSO THE 42ND YEAR OF THE PLANT WAS AN UNDISTURBED OPERATION YEAR. THANKS TO CONTINUOUS IMPROVEMENTS IN THE SAFETY AND PERFORMANCE OF THE PLANT SYSTEMS, THE NPP PRODUCED 3155 GWH AND ACHIEVED THE NEW PLANT PRODUCTION RECORD. THE PLANT SUPPLIED SAFE AND CLEAN ELECTRICITY INTO THE GRID FOR 8'146 HOURS. IN ORDER TO PRESERVE THE GRID STABILITY, IT WAS REQUESTED BY THE CONTROL CENTER OF SWISS GRID TO REDUCE THE POWER OUTPUT OF THE PLANT NINE TIMES. THE GRID INSTABILITIES BEING DUE TO THE IRREGULAR SUPPLIES OF RENEWABLE ENERGIES. ON AUGUST 10, BEGAN THE ANNUAL PLANT OUTAGE WHICH LASTED XX DAYS. THE MAIN FOCUS OF THIS ANNUAL OUTAGE WERE RIGOROUS INSPECTIONS AND ACCURATE TESTS OF: THE REACTOR PRESSURE VESSEL (RPV), SECURITY SYSTEMS, ELECTRICAL PROTECTION/CONTROL SYSTEMS, AND THE PERFORMANCE OF KEY COMPONENTS. FOLLOWING OUR PREVENTIVE MAINTENANCE POLICY, AIMING TO PRESERVE THE PLANT'S SYSTEMS AT THE STATE-OF-THE-ART, THE PLANT CREW REPLACED 6 OUT OF 57 CONTROL ROD DRIVES.

### 5. Historical Summary

Date of Construction Start: 01 Mar 1967      Lifetime Generation: 107484.1 GW(e)·h  
 Date of First Criticality: 08 Mar 1971      Cumulative Energy Availability Factor: 86.7%  
 Date of Grid Connection: 01 Jul 1971      Cumulative Load Factor: 87.2%  
 Date of Commercial Operation: 06 Nov 1972      Cumulative Unit Capability Factor: 87.7%  
    Cumulative Energy Unavailability Factor: 13.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1972	387.9	323	92.2	92.2	92.2	92.2	82.0	82.0	1334	91.1
1973	2011.6	306	80.7	82.4	80.7	82.4	75.0	76.1	7315	83.5
1974	1846.2	306	73.2	78.2	73.2	78.2	68.9	72.8	7062	80.6
1975	2344.1	306	87.1	81.0	87.1	81.0	87.4	77.4	7989	91.2
1976	2355.2	306	85.2	82.0	85.2	82.0	87.6	79.8	7960	90.6
1977	2429.3	320	85.7	82.7	85.7	82.7	86.7	81.2	8097	92.4
1978	2465.7	320	87.3	83.5	87.3	83.5	88.0	82.3	8001	91.3
1979	2473.9	320	87.7	84.1	87.7	84.1	88.3	83.2	8024	91.6
1980	2482.4	320	88.5	84.6	88.5	84.6	88.3	83.8	8005	91.1
1981	2539.0	324	89.1	85.2	89.1	85.2	89.5	84.5	8051	91.9
1982	2663.3	326	88.9	85.5	88.9	85.5	93.3	85.4	8017	91.5
1983	2564.3	326	89.6	85.9	89.6	85.9	89.8	85.8	8026	91.6
1984	2527.2	326	88.1	86.1	88.1	86.1	88.3	86.0	7989	90.9

1985	2500.7	323	87.3	86.2	87.2	86.2	88.2	86.1	7882	90.0
1986	2114.5	326	73.7	85.3	73.7	85.3	74.0	85.3	6645	75.9
1987	2465.0	326	85.5	85.3	85.5	85.3	86.3	85.3	7959	90.9
1988	2497.6	326	87.1	85.4	87.1	85.4	87.2	85.5	7968	90.7
1989	2297.5	323	81.3	85.2	81.3	85.2	81.0	85.2	7226	82.5
1990	2477.9	324	86.5	85.2	86.5	85.2	87.3	85.3	7910	90.3
1991	2415.1	323	87.3	85.4	84.8	85.2	85.4	85.3	7714	88.1
1992	2413.5	323	85.0	85.3	85.0	85.2	85.1	85.3	7755	88.3
1993	2568.5	338	88.5	85.5	86.8	85.3	86.5	85.4	7917	90.4
1994	2643.1	355	89.3	85.7	84.9	85.3	85.0	85.3	7952	90.8
1995	2669.0	355	87.8	85.8	85.4	85.3	85.8	85.4	7894	90.1
1996	2649.0	355	87.7	85.9	84.4	85.2	85.0	85.3	7847	89.3
1997	2549.2	355	86.9	85.9	81.8	85.1	82.0	85.2	7671	87.6
1998	2659.7	355	86.5	85.9	85.2	85.1	85.5	85.2	7886	90.0
1999	2702.8	355	87.2	86.0	86.6	85.1	86.9	85.3	8064	92.1
2000	2817.0	355	93.5	86.3	90.1	85.3	90.3	85.5	8290	94.4
2001	2768.7	355	93.3	86.5	88.8	85.5	89.0	85.6	8195	93.6
2002	2828.2	355	91.4	86.7	87.7	85.5	90.9	85.8	8280	94.5
2003	2744.2	355	89.6	86.8	87.7	85.6	88.2	85.9	8034	91.7
2004	2906.1	355	93.3	87.0	92.4	85.8	93.2	86.1	8282	94.3
2005	2855.3	355	92.7	87.2	91.0	86.0	91.8	86.3	8130	92.8
2006	2882.9	355	92.7	87.4	90.9	86.2	92.7	86.5	8174	93.3
2007	2900.4	355	90.6	87.5	90.5	86.3	93.3	86.7	8021	91.6
2008	2973.3	355	91.4	87.6	91.3	86.4	95.3	87.0	8114	92.4
2009	2983.6	373	90.8	87.7	90.7	86.6	91.3	87.1	8025	91.6
2010	3008.8	373	91.6	87.8	91.3	86.7	92.1	87.2	8198	93.6
2011	2495.9	373	75.7	87.5	75.7	86.4	76.4	86.9	6707	76.6
2012	2971.3	373	90.7	87.5	90.7	86.5	90.7	87.0	8017	91.3
2013	2919.5	373	89.5	87.6	89.4	86.6	89.3	87.1	7947	90.7
2014	3014.6	373	92.4	87.7	92.3	86.7	92.3	87.2	8146	93.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					152	
C. Inspection, maintenance or repair combined with refuelling	611			779		
D. Inspection, maintenance or repair without refuelling				19		
E. Testing of plant systems or components				2		
H. Nuclear regulatory requirements					0	
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					2	
Subtotal	611	0	0	800	155	0
Total	611			955		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		0
13. Reactor Auxiliary Systems		0
14. Safety Systems		2
15. Reactor Cooling Systems		1
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		136
32. Feedwater and Main Steam System		1
33. Circulating Water System		1

35. All other I&C Systems		0
42. Electrical Power Supply Systems		0
XX. Miscellaneous Systems		0
Total	0	147

**TW-1 CHINSHAN-1****Operator:** TPC (Taiwan Power Co.)**Contractor:** GE (GENERAL ELECTRIC CO.)**1. Station Details**

**Type:** BWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 604.0 MW(e)

**Design Net Capacity:** 604.0 MW(e)

**Design Discharge Burnup:** 30000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 4874.7 GW(e)·h

**Energy Availability Factor:** 90.8%

**Load Factor:** 92.1%

**Operating Factor:** 91.2%

**Energy Unavailability Factor:** 9.2%

**Total Off-line Time:** 770 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	459.1	417.1	459.4	443.4	455.3	286.3	446.4	440.8	436.2	454.0	443.5	133.2	4874.7
<b>EAF (%)</b>	99.4	100.0	99.6	100.0	99.8	65.4	99.3	98.1	100.0	99.7	100.0	28.9	90.8
<b>UCF (%)</b>	99.4	100.0	99.6	100.0	99.8	65.4	99.7	98.3	100.0	99.7	100.0	28.9	90.8
<b>LF (%)</b>	102.2	102.8	102.2	102.0	101.3	65.8	99.3	98.1	100.3	101.0	102.0	29.6	92.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	67.1	100.0	98.9	100.0	100.0	100.0	29.4	91.2
<b>EUf (%)</b>	0.6	0.0	0.4	0.0	0.2	34.6	0.7	1.9	0.0	0.3	0.0	71.1	9.2
<b>PUf (%)</b>	0.0	0.0	0.4	0.0	0.0	33.9	0.3	0.0	0.0	0.3	0.0	71.1	8.9
<b>UCLF (%)</b>	0.6	0.0	0.0	0.0	0.2	0.7	0.0	1.7	0.0	0.0	0.0	0.0	0.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

1.REPAIR THE HIGH PRESSURE TURBINE STARTED AT 2014-01-28 19:30,DURATION 10.35 HRS.2.SEISMIC MARGIN ASSESSMENT ENHANCEMEN STARTED AT 2014-06-05 18:14,DURATION 236.68 HRS.3.REPAIR CONDENSATE PUMP A SEAL STARTED STARTED AT 2014-06-24 01:46,DURATION 34.45 HRS.4.CORRECTIVE ACTION FOR HIGH TEMPERATURE DIFFERENCE BETWEEN 3 PHASES OF MAIN TRANSFORMER HIGH VOLTAGE SIDE BUSHING CONNECTOR STARTED AT 2014-08-26 19:07,DURATION 7.68 HRS.5.EOC-27 REFUELING OUTAGE STARTED AT 2014-12-10 03:00,DURATION 525 HRS.(OVERYEAR OUTAGE)

**5. Historical Summary**

**Date of Construction Start:** 02 Jun 1972 **Lifetime Generation:** 155048.7 GW(e)·h

**Date of First Criticality:** 16 Oct 1977 **Cumulative Energy Availability Factor:** 83.4%

**Date of Grid Connection:** 16 Nov 1977 **Cumulative Load Factor:** 83.0%

**Date of Commercial Operation:** 10 Dec 1978 **Cumulative Unit Capability Factor:** 84.2%

**Cumulative Energy Unavailability Factor:** 16.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1978			Data not provided							
1979										
1980										
1981										
1982										
1983										
1984										
1985										
1986										
1987										
1988										
1989	2783.4	604	55.3	55.3	55.3	55.3	52.6	52.6	5226	59.7
1990	2968.5	591	55.4	55.3	54.8	55.1	57.3	54.9	5315	60.7
1991	4391.4	604	83.9	64.9	82.0	64.1	83.0	64.4	7602	86.8
1992	4017.7	604	77.6	68.1	76.6	67.3	75.7	67.2	7260	82.7
1993	4424.0	604	86.5	71.8	83.0	70.4	83.6	70.5	7854	89.7
1994	3645.4	604	69.4	71.4	67.7	70.0	68.9	70.2	6458	73.7
1995	4154.3	604	81.0	72.8	80.5	71.5	78.5	71.4	7168	81.8

1996	4070.9	604	81.8	73.9	78.6	72.4	76.7	72.1	7051	80.3
1997	4990.5	604	96.4	76.4	96.2	75.0	94.3	74.6	8558	97.7
1998	4295.1	604	85.2	77.3	83.5	75.9	81.2	75.2	7448	85.0
1999	4081.1	604	81.2	77.7	78.8	76.1	77.1	75.4	7156	81.7
2000	5226.1	604	99.8	79.5	99.2	78.1	98.5	77.3	8784	100.0
2001	4319.7	604	82.1	79.7	81.5	78.3	81.6	77.7	7282	83.1
2002	4376.0	604	83.5	80.0	83.4	78.7	82.7	78.0	7367	84.1
2003	5240.0	604	99.6	81.3	99.4	80.1	99.0	79.4	8760	100.0
2004	4541.9	604	86.4	81.6	85.8	80.4	85.6	79.8	7646	87.0
2005	4573.8	604	87.9	82.0	86.8	80.8	86.4	80.2	7745	88.4
2006	5201.8	604	99.5	83.0	99.5	81.8	98.3	81.2	8760	100.0
2007	4607.9	604	88.8	83.3	88.2	82.2	87.1	81.5	7834	89.4
2008	3998.9	604	75.6	82.9	75.4	81.8	75.4	81.2	6822	77.7
2009	5173.7	604	97.9	83.6	97.8	82.6	97.8	82.0	8668	98.9
2010	4401.4	604	83.2	83.6	83.2	82.6	83.2	82.1	7351	83.9
2011	4781.8	604	90.4	83.9	90.4	83.0	90.4	82.4	7945	90.7
2012	5143.2	604	96.9	84.4	96.9	83.5	96.9	83.0	8575	97.6
2013	3848.5	604	73.2	84.0	72.7	83.1	72.7	82.6	6447	73.6
2014	4874.7	604	90.8	84.2	90.8	83.4	92.1	83.0	7990	91.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		7			197	
B. Refuelling without a maintenance				74		
C. Inspection, maintenance or repair combined with refuelling	525			896		
D. Inspection, maintenance or repair without refuelling	236			32		
E. Testing of plant systems or components				0	8	
H. Nuclear regulatory requirements					0	
J. Grid limitation, failure or grid unavailability						5
Z. Other						12
Subtotal	761	7	0	1002	205	17
Total		768			1224	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		5
14. Safety Systems		43
15. Reactor Cooling Systems		32
31. Turbine and auxiliaries		45
32. Feedwater and Main Steam System		2
41. Main Generator Systems		37
42. Electrical Power Supply Systems	7	30
Total	7	194

## TW-2 CHINSHAN-2

Operator: TPC (Taiwan Power Co.)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 604.0 MW(e)  
 Design Net Capacity: 604.0 MW(e)  
 Design Discharge Burnup: 30000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 4896.5 GW(e)·h  
 Energy Availability Factor: 89.4%  
 Load Factor: 92.5%  
 Operating Factor: 90.0%  
 Energy Unavailability Factor: 10.6%  
 Total Off-line Time: 872 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	471.3	424.2	470.4	405.3	0.0	389.9	455.1	458.2	441.3	463.9	447.9	469.1	4896.5
EAF (%)	100.0	99.7	100.0	89.7	0.0	86.7	99.2	100.0	99.6	100.0	99.1	99.9	89.4
UCF (%)	100.0	99.7	100.0	89.7	0.0	86.7	99.4	100.0	99.6	100.0	99.1	99.9	89.4
LF (%)	104.9	104.5	104.7	93.2	0.0	89.7	101.3	102.0	101.5	103.2	103.0	104.4	92.5
OF (%)	100.0	100.0	100.0	90.4	0.0	91.8	100.0	100.0	100.0	100.0	100.0	100.0	90.0
EUf (%)	0.0	0.3	0.0	10.3	100.0	13.3	0.8	0.0	0.4	0.0	0.9	0.1	10.6
PUf (%)	0.0	0.3	0.0	10.3	100.0	5.5	0.0	0.0	0.4	0.0	0.9	0.1	9.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	7.8	0.6	0.0	0.0	0.0	0.0	0.0	0.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1.EOC-26 REFUELING OUTAGE STARTED AT 2014-04-28 2:54,DURATION 974.07 HRE.2.REPAIR THE TURBINE BY-PASS VALVE STARTED AT 2014-06-02 10:28,DURATION 35.53 HRE.3.REPAIR REACTOR RECIRCULATION PUMP STARTED AT 2014-07-16 16:15,DURATION 8.75 HRE.4.MAINTAIN RECIRC. M-G SET B STARTED AT 2014-11-30 13:26,DURATION 8.73 HRE.

### 5. Historical Summary

Date of Construction Start: 07 Dec 1973      Lifetime Generation: 155143.5 GW(e)·h  
 Date of First Criticality: 09 Nov 1978      Cumulative Energy Availability Factor: 83.7%  
 Date of Grid Connection: 19 Dec 1978      Cumulative Load Factor: 83.8%  
 Date of Commercial Operation: 15 Jul 1979      Cumulative Unit Capability Factor: 84.6%  
    Cumulative Energy Unavailability Factor: 16.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979			Data not provided							
1980			"							
1981			"							
1982			"							
1983			"							
1984			"							
1985			"							
1986			"							
1987			"							
1988			"							
1989	3059.8	604	59.3	59.3	59.3	59.3	57.8	57.8	6010	68.6
1990	3436.8	593	65.4	62.3	64.8	62.1	66.2	62.0	6242	71.3
1991	3783.5	604	72.5	65.8	70.1	64.8	71.5	65.2	6847	78.2
1992	4129.2	604	79.1	69.1	78.5	68.2	77.8	68.3	7326	83.4
1993	3934.9	604	76.7	70.6	73.1	69.2	74.4	69.6	6992	79.8
1994	3979.5	604	78.8	72.0	76.6	70.4	75.2	70.5	7001	79.9
1995	3885.7	604	77.5	72.8	75.9	71.2	73.4	70.9	6808	77.7
1996	4001.5	604	78.0	73.4	77.5	72.0	75.4	71.5	6897	78.5
1997	4325.5	604	80.6	74.2	80.1	72.9	81.8	72.6	7168	81.8
1998	4841.5	604	96.0	76.4	94.7	75.1	91.5	74.5	8422	96.1

1999	4296.3	604	82.6	77.0	80.7	75.6	81.2	75.1	7274	83.0
2000	4596.5	604	85.9	77.7	85.3	76.4	86.6	76.1	7584	86.3
2001	5018.1	604	95.0	79.0	93.9	77.8	94.8	77.5	8515	97.2
2002	4290.4	604	80.6	79.2	80.5	77.9	81.1	77.8	7414	84.6
2003	4574.5	604	86.5	79.6	86.0	78.5	86.5	78.4	7595	86.7
2004	5247.6	604	98.6	80.8	98.0	79.7	98.9	79.7	8704	99.1
2005	4530.5	604	86.3	81.2	85.2	80.0	85.6	80.0	7641	87.2
2006	4650.8	604	88.4	81.6	87.5	80.4	87.9	80.4	7812	89.2
2007	5218.8	604	99.6	82.5	98.3	81.4	98.6	81.4	8654	98.8
2008	4422.4	604	83.6	82.6	83.4	81.5	83.4	81.5	7375	84.0
2009	4492.1	604	85.0	82.7	84.9	81.6	84.9	81.7	7501	85.6
2010	5208.1	604	98.4	83.4	98.4	82.4	98.4	82.4	8683	99.1
2011	4658.0	604	88.0	83.6	88.0	82.7	88.0	82.7	7763	88.6
2012	4709.1	604	88.8	83.8	88.8	82.9	88.8	82.9	7828	89.1
2013	5148.5	604	97.8	84.4	97.3	83.5	97.3	83.5	8609	98.3
2014	4896.5	604	89.4	84.6	89.4	83.7	92.5	83.8	7888	90.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		56			188	
B. Refuelling without a maintenance				72		
C. Inspection, maintenance or repair combined with refuelling	816			848		
D. Inspection, maintenance or repair without refuelling				53		
E. Testing of plant systems or components				2		
H. Nuclear regulatory requirements					0	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					7	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						6
Z. Other						2
Subtotal	816	56	0	975	195	12
Total		872			1182	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		28
12. Reactor I&C Systems		7
14. Safety Systems		1
15. Reactor Cooling Systems		47
31. Turbine and auxiliaries	35	36
32. Feedwater and Main Steam System		14
33. Circulating Water System		8
41. Main Generator Systems		35
42. Electrical Power Supply Systems	20	9
Total	55	185



# TW-3 KUOSHENG-1

Operator: TPC (Taiwan Power Co.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 985.0 MW(e)  
 Design Net Capacity: 951.0 MW(e)  
 Design Discharge Burnup: —  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8490.7 GW(e)-h  
 Energy Availability Factor: 98.0%  
 Load Factor: 98.4%  
 Operating Factor: 98.9%  
 Energy Unavailability Factor: 2.0%  
 Total Off-line Time: 96 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)-h	604.7	669.5	731.5	715.7	732.8	703.0	726.8	728.6	698.2	734.3	712.2	733.4	8490.7
EAF (%)	82.4	99.9	98.8	100.0	99.5	99.1	99.2	99.4	98.5	100.0	99.9	99.3	98.0
UCF (%)	82.8	99.9	99.1	100.0	99.5	99.5	99.8	99.9	99.3	100.0	99.9	99.6	98.2
LF (%)	82.5	101.1	99.8	100.9	100.0	99.1	99.2	99.4	98.5	100.2	100.4	100.1	98.4
OF (%)	87.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.9
EUf (%)	17.6	0.1	1.2	0.0	0.5	0.9	0.8	0.6	1.5	0.0	0.1	0.7	2.0
PUf (%)	17.2	0.1	0.9	0.0	0.1	0.6	0.2	0.0	0.7	0.0	0.1	0.4	1.7
UCLF (%)	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.5	0.0	0.3	0.0	0.0	0.3	0.6	0.5	0.8	0.0	0.0	0.3	0.3

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

1. REACTOR VESSEL WAS OPENED FOR EOC-23 REFUELING OUTAGE FROM 1ST JANUARY TO 4TH JANUARY.

## 5. Historical Summary

Date of Construction Start: 19 Nov 1975      Lifetime Generation: 223838.5 GW(e)-h  
 Date of First Criticality: 01 Feb 1981      Cumulative Energy Availability Factor: 84.1%  
 Date of Grid Connection: 21 May 1981      Cumulative Load Factor: 83.3%  
 Date of Commercial Operation: 28 Dec 1981      Cumulative Unit Capability Factor: 84.8%  
    Cumulative Energy Unavailability Factor: 15.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	Data not provided									
1982	"									
1983	"									
1984	"									
1985	"									
1986	"									
1987	"									
1988	"									
1989	5329.1	951	64.9	64.9	63.0	63.0	64.0	64.0	6447	73.6
1990	6898.0	918	87.4	76.0	86.8	74.7	85.8	74.7	8201	93.6
1991	5850.8	951	71.4	74.4	71.4	73.6	70.2	73.2	6678	76.2
1992	6152.4	951	78.4	75.4	78.4	74.8	73.6	73.3	7126	81.1
1993	5679.5	951	71.1	74.6	71.1	74.0	68.2	72.3	6457	73.7
1994	6302.3	950	77.8	75.1	76.9	74.5	75.7	72.8	7077	80.8
1995	6897.9	948	84.7	76.5	84.6	76.0	83.1	74.3	7734	88.3
1996	6950.8	948	84.8	77.5	84.3	77.0	83.5	75.5	7573	86.2
1997	6277.8	948	77.7	77.5	77.5	77.1	75.6	75.5	6978	79.7
1998	6426.0	948	81.2	77.9	79.7	77.3	77.4	75.7	7209	82.3
1999	7686.8	948	95.1	79.5	93.8	78.8	92.6	77.2	8439	96.3
2000	6588.6	948	81.3	79.6	80.2	78.9	79.1	77.4	7391	84.1
2001	6452.3	948	79.4	79.6	78.8	78.9	77.7	77.4	7070	80.7
2002	8068.5	948	98.5	81.0	98.1	80.3	97.2	78.8	8693	99.2
2003	6444.9	948	78.5	80.8	78.3	80.2	77.6	78.7	6968	79.5

2004	6978.5	948	85.1	81.1	84.7	80.5	83.8	79.0	7516	85.6
2005	8150.1	948	99.7	82.2	98.4	81.5	98.1	80.2	8749	99.9
2006	6903.6	948	82.6	82.2	81.9	81.5	81.0	80.2	7325	83.6
2007	7104.6	985	83.5	82.3	82.3	81.6	82.3	80.3	7429	84.8
2008	8384.8	985	98.0	83.1	96.9	82.4	96.9	81.2	8673	98.7
2009	7558.4	985	88.3	83.3	87.5	82.6	87.6	81.5	7823	89.3
2010	7949.6	985	92.4	83.8	91.9	83.1	92.1	82.0	8150	93.0
2011	8564.7	985	99.7	84.5	99.1	83.8	99.3	82.8	8760	100.0
2012	6170.6	985	71.8	83.9	71.3	83.2	71.3	82.3	6412	73.0
2013	7859.1	985	92.2	84.3	91.1	83.6	91.1	82.6	8165	93.2
2014	8490.7	985	98.2	84.8	98.0	84.1	98.4	83.3	8664	98.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					116	
B. Refuelling without a maintenance				66		
C. Inspection, maintenance or repair combined with refuelling	96			886		
D. Inspection, maintenance or repair without refuelling				68		
E. Testing of plant systems or components				8		
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					11	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
Z. Other						2
Subtotal	96	0	0	1028	127	6
Total		96			1161	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		23
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		2
15. Reactor Cooling Systems		4
31. Turbine and auxiliaries		22
32. Feedwater and Main Steam System		27
33. Circulating Water System		8
35. All other I&C Systems		1
41. Main Generator Systems		12
42. Electrical Power Supply Systems		7
Total	0	110

## TW-4 KUOSHENG-2

Operator: TPC (Taiwan Power Co.)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 985.0 MW(e)  
 Design Net Capacity: 951.0 MW(e)  
 Design Discharge Burnup: —  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7917.0 GW(e)·h  
 Energy Availability Factor: 91.3%  
 Load Factor: 91.8%  
 Operating Factor: 92.4%  
 Energy Unavailability Factor: 8.7%  
 Total Off-line Time: 662 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	736.6	661.8	741.5	708.1	722.5	708.3	724.6	721.7	443.2	294.7	711.9	742.2	7917.0
EAF (%)	99.9	99.0	100.0	99.2	98.4	99.9	98.9	98.5	62.5	40.2	99.5	100.0	91.3
UCF (%)	99.9	99.4	100.0	99.2	98.7	99.9	99.7	99.5	62.9	40.4	99.5	100.0	91.5
LF (%)	100.5	100.0	101.2	99.9	98.6	99.9	98.9	98.5	62.5	40.2	100.4	101.3	91.8
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.5	46.4	100.0	100.0	92.4
EUF (%)	0.1	1.0	0.0	0.8	1.6	0.1	1.1	1.5	37.5	59.8	0.5	0.0	8.7
PUF (%)	0.1	0.6	0.0	0.8	1.3	0.1	0.3	0.5	37.1	56.1	0.5	0.0	8.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.3
XUF (%)	0.0	0.3	0.0	0.0	0.3	0.1	0.8	1.0	0.4	0.1	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1. REACTOR VESSEL WAS OPENED FOR EOC-23 REFUELING OUTAGE FROM 20TH SEPTEMBER TO 16TH OCTOBER.
2. THE REACTOR WAS IN HOT STANDBY FOR REPAIRING RECIRC. PUMP A.

### 5. Historical Summary

Date of Construction Start: 15 Mar 1976      Lifetime Generation: 217851.5 GW(e)·h  
 Date of First Criticality: 26 Mar 1982      Cumulative Energy Availability Factor: 84.1%  
 Date of Grid Connection: 29 Jun 1982      Cumulative Load Factor: 83.3%  
 Date of Commercial Operation: 16 Mar 1983      Cumulative Unit Capability Factor: 85.2%  
    Cumulative Energy Unavailability Factor: 15.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	Data not provided									
1984	"									
1985	"									
1986	"									
1987	"									
1988	"									
1989	5227.3	951	65.3	65.3	61.9	61.9	62.7	62.7	6390	72.9
1990	6000.6	936	74.0	69.6	73.5	67.6	73.2	67.9	6819	77.8
1991	7186.3	951	89.3	76.2	89.3	74.9	86.3	74.1	8101	92.5
1992	6176.3	951	76.8	76.4	76.8	75.4	73.9	74.0	6985	79.5
1993	6138.1	951	74.9	76.1	74.9	75.3	73.7	74.0	6921	79.0
1994	6224.1	950	76.0	76.1	74.8	75.2	74.8	74.1	6868	78.4
1995	5999.7	948	72.9	75.6	72.2	74.8	72.2	73.8	6543	74.7
1996	7423.2	948	90.0	77.4	89.6	76.6	89.1	75.8	7978	90.8
1997	7087.2	948	88.7	78.7	86.1	77.7	85.3	76.8	7745	88.4
1998	6549.6	948	80.3	78.8	79.3	77.8	78.9	77.0	7242	82.7
1999	6831.9	948	85.9	79.5	84.2	78.4	82.3	77.5	7544	86.1
2000	7237.6	948	91.4	80.5	89.3	79.3	86.9	78.3	8234	93.7
2001	5976.7	948	74.1	80.0	72.4	78.8	72.0	77.8	6772	77.3
2002	6922.6	948	85.5	80.4	85.1	79.2	83.4	78.2	7530	86.0
2003	7623.1	948	93.7	81.3	93.5	80.2	91.8	79.1	8427	96.2
2004	6494.0	948	81.3	81.3	79.8	80.2	78.0	79.0	7301	83.1

2005	6737.8	948	83.5	81.4	82.3	80.3	81.1	79.2	7424	84.7
2006	7868.4	948	96.6	82.2	95.9	81.2	94.7	80.0	8560	97.7
2007	7031.5	948	86.7	82.5	86.1	81.4	84.7	80.3	7716	88.1
2008	7305.0	948	89.9	82.9	87.7	81.7	87.7	80.6	8029	91.4
2009	8068.1	948	99.2	83.6	97.2	82.5	97.2	81.4	8739	99.8
2010	6997.8	948	86.3	83.8	84.3	82.5	84.3	81.6	7649	87.3
2011	7443.5	985	89.1	84.0	88.8	82.8	89.3	81.9	7909	90.3
2012	8530.3	985	99.3	84.6	98.5	83.5	98.6	82.6	8765	99.8
2013	7784.6	985	91.0	84.9	90.2	83.8	90.2	82.9	8057	92.0
2014	7917.0	985	91.5	85.2	91.3	84.1	91.8	83.3	8098	92.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		16			107	
B. Refuelling without a maintenance				42		
C. Inspection, maintenance or repair combined with refuelling	646			825		
D. Inspection, maintenance or repair without refuelling				84		
E. Testing of plant systems or components				15		
J. Grid limitation, failure or grid unavailability						7
L. Human factor related					12	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						12
Z. Other					0	1
Subtotal	646	16	0	966	119	20
Total		662			1105	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		33
12. Reactor I&C Systems	16	3
13. Reactor Auxiliary Systems		1
14. Safety Systems		4
15. Reactor Cooling Systems		16
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		12
32. Feedwater and Main Steam System		16
33. Circulating Water System		3
35. All other I&C Systems		7
41. Main Generator Systems		3
42. Electrical Power Supply Systems		4
Total	16	102

## TW-5 MAANSHAN-1

Operator: TPC (Taiwan Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 926.0 MW(e)  
 Design Net Capacity: 890.0 MW(e)  
 Design Discharge Burnup: 43000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7913.6 GW(e)·h  
 Energy Availability Factor: 96.6%  
 Load Factor: 97.6%  
 Operating Factor: 97.2%  
 Energy Unavailability Factor: 3.4%  
 Total Off-line Time: 243 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	697.7	631.1	697.9	447.8	693.8	664.7	691.0	692.5	640.8	694.1	673.1	689.0	7913.6
EAF (%)	99.8	99.9	99.9	66.5	99.9	99.2	99.9	99.9	95.7	99.9	99.9	98.5	96.6
UCF (%)	99.8	100.0	99.9	66.5	100.0	99.2	99.9	99.9	95.7	99.9	99.9	98.5	96.6
LF (%)	101.3	101.4	101.3	67.2	100.7	99.7	100.3	100.5	96.1	100.8	101.0	100.0	97.6
OF (%)	100.0	100.0	100.0	68.3	100.0	100.0	100.0	100.0	97.9	100.0	100.0	100.0	97.2
EUf (%)	0.2	0.1	0.1	33.5	0.1	0.8	0.1	0.1	4.3	0.1	0.1	1.5	3.4
PUf (%)	0.1	0.1	0.1	31.5	0.1	0.8	0.1	0.1	0.0	0.1	0.1	0.0	2.7
UCLF (%)	0.1	0.0	0.0	1.9	0.0	0.0	0.0	0.0	4.3	0.0	0.0	1.5	0.6
XUF (%)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1.04/18 19:05 UNIT OFF-LINE FOR SEISMIC MARGIN ASSESSMENT. 2.04/27 22:22 UNIT OFF-LINE REPAIRED STEAM SHUTOFF VALVE AB-HV208 OIL SPILL. 3.09/06 03:58 UNIT OFF-LINE REPAIRED STATOR COOLING WATER FILTER DEBRIS.

### 5. Historical Summary

Date of Construction Start: 21 Aug 1978      Lifetime Generation: 194219.2 GW(e)·h  
 Date of First Criticality: 30 Mar 1984      Cumulative Energy Availability Factor: 85.5%  
 Date of Grid Connection: 09 May 1984      Cumulative Load Factor: 86.6%  
 Date of Commercial Operation: 27 Jul 1984      Cumulative Unit Capability Factor: 86.7%  
    Cumulative Energy Unavailability Factor: 14.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	Data not provided									
1985	"									
1986	"									
1987	"									
1988	"									
1989	5418.4	890	66.3	66.3	66.0	66.0	69.5	69.5	6305	72.0
1990	6098.9	894	77.8	72.0	76.8	71.4	77.9	73.7	7079	80.8
1991	6479.1	890	84.0	76.0	82.7	75.2	83.1	76.8	7368	84.1
1992	6038.8	890	76.7	76.2	76.2	75.4	77.2	76.9	6826	77.7
1993	6258.8	890	78.5	76.7	78.5	76.0	80.3	77.6	6930	79.1
1994	6322.6	890	79.7	77.2	79.6	76.6	81.1	78.2	7098	81.0
1995	6741.1	890	84.5	78.2	84.4	77.7	86.5	79.4	7495	85.6
1996	7537.0	890	95.8	80.4	93.8	79.7	96.4	81.5	8329	94.8
1997	5949.2	890	74.8	79.8	74.3	79.1	76.3	80.9	6752	77.1
1998	5514.5	890	69.2	78.7	69.2	78.1	70.7	79.9	6101	69.6
1999	7392.7	890	96.3	80.3	92.6	79.5	94.8	81.3	8328	95.1
2000	6729.0	890	84.6	80.7	84.3	79.9	86.1	81.7	7502	85.4
2001	5333.3	890	86.1	81.1	67.6	78.9	68.4	80.6	6046	69.0
2002	7800.8	890	98.8	82.4	98.7	80.3	100.1	82.0	8726	99.6
2003	6751.0	890	87.3	82.7	86.2	80.7	86.6	82.3	7579	86.5
2004	6793.7	890	87.4	83.0	86.8	81.1	86.9	82.6	7742	88.1

2005	7701.7	890	98.1	83.9	98.0	82.1	98.8	83.6	8693	99.2
2006	6763.2	890	85.8	84.0	85.8	82.3	86.7	83.7	7599	86.7
2007	7168.2	890	90.9	84.3	90.8	82.7	91.9	84.2	8001	91.3
2008	7904.9	900	100.0	85.1	100.0	83.6	100.0	85.0	8784	100.0
2009	7205.2	918	90.5	85.4	90.3	83.9	90.3	85.2	7959	90.9
2010	7272.4	919	90.7	85.7	90.7	84.3	90.3	85.5	8009	91.4
2011	8022.1	918	99.9	86.3	99.9	85.0	99.8	86.1	8760	100.0
2012	6994.8	928	86.2	86.3	86.0	85.0	86.3	86.1	7620	86.7
2013	7011.6	926	86.6	86.3	86.1	85.0	86.4	86.1	7615	86.9
2014	7913.6	926	96.6	86.7	96.6	85.5	97.6	86.6	8517	97.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		23			233	
B. Refuelling without a maintenance				29		
C. Inspection, maintenance or repair combined with refuelling				795		
D. Inspection, maintenance or repair without refuelling	218			9		
E. Testing of plant systems or components				6		
H. Nuclear regulatory requirements					0	
J. Grid limitation, failure or grid unavailability						64
L. Human factor related					7	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
Z. Other						7
Subtotal	218	23	0	839	240	75
Total		241			1154	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		79
13. Reactor Auxiliary Systems		7
15. Reactor Cooling Systems		17
16. Steam generation systems		17
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System	8	6
41. Main Generator Systems	14	60
42. Electrical Power Supply Systems		27
Total	22	229

## TW-6 MAANSHAN-2

Operator: TPC (Taiwan Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 928.0 MW(e)  
 Design Net Capacity: 890.0 MW(e)  
 Design Discharge Burnup: 43000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6708.5 GW(e)·h  
 Energy Availability Factor: 81.4%  
 Load Factor: 82.5%  
 Operating Factor: 82.2%  
 Energy Unavailability Factor: 18.6%  
 Total Off-line Time: 1562 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	700.7	633.1	111.5	0.0	482.7	676.1	697.2	698.9	656.2	671.2	677.5	703.5	6708.5
EAF (%)	99.9	99.9	15.9	0.0	69.2	99.9	99.9	100.0	97.2	96.1	99.9	99.9	81.4
UCF (%)	99.9	99.9	15.9	0.0	69.3	100.0	99.9	100.0	97.2	96.1	99.9	100.0	81.4
LF (%)	101.5	101.5	16.1	0.0	69.9	101.2	101.0	101.2	98.2	97.2	101.4	101.9	82.5
OF (%)	100.0	100.0	16.3	0.0	72.3	100.0	100.0	100.0	98.2	100.0	100.0	100.0	82.2
EUf (%)	0.1	0.1	84.1	100.0	30.8	0.1	0.1	0.0	2.8	3.9	0.1	0.1	18.6
PUf (%)	0.1	0.1	84.1	100.0	30.7	0.1	0.0	0.0	0.0	0.1	0.1	0.1	18.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	2.8	3.9	0.0	0.0	0.6
XUF (%)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

1.03/06 01:45 UNIT OFF-LINE FOR EOC-21 REFUELING OUTAGE. 2.09/07 07:01 UNIT OFF-LINE REPAIRED STATOR COOLING WATER FILTER DEBRIS.

### 5. Historical Summary

Date of Construction Start: 21 Feb 1979      Lifetime Generation: 197235.2 GW(e)·h  
 Date of First Criticality: 01 Feb 1985      Cumulative Energy Availability Factor: 85.6%  
 Date of Grid Connection: 25 Feb 1985      Cumulative Load Factor: 87.1%  
 Date of Commercial Operation: 18 May 1985      Cumulative Unit Capability Factor: 87.1%  
    Cumulative Energy Unavailability Factor: 14.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	Data not provided									
1986	"									
1987	"									
1988	"									
1989	5283.3	890	58.8	58.8	58.1	58.1	67.8	67.8	6434	73.4
1990	6141.3	896	78.8	68.9	77.3	67.7	78.2	73.0	7143	81.5
1991	6187.1	890	80.4	72.7	78.6	71.3	79.4	75.1	7155	81.7
1992	5956.6	890	84.3	75.6	75.5	72.4	76.2	75.4	7541	85.8
1993	6551.0	890	84.1	77.3	84.1	74.7	84.0	77.1	7442	85.0
1994	7006.5	890	93.3	80.0	88.7	77.0	89.9	79.2	8216	93.8
1995	6118.6	890	77.1	79.6	77.1	77.1	78.5	79.1	6947	79.3
1996	6349.8	890	81.0	79.7	79.8	77.4	81.2	79.4	7091	80.7
1997	6415.4	890	81.6	79.9	81.1	77.8	82.3	79.7	7153	81.7
1998	7781.1	890	97.4	81.7	97.2	79.7	99.8	81.7	8557	97.7
1999	6628.4	890	85.3	82.0	82.7	80.0	85.0	82.0	7427	84.8
2000	6618.6	890	84.1	82.2	82.6	80.2	84.7	82.2	7401	84.3
2001	6993.8	890	99.4	83.5	87.3	80.8	89.7	82.8	7729	88.2
2002	6639.8	890	82.4	83.4	82.4	80.9	85.2	83.0	7507	85.7
2003	6737.6	890	86.6	83.6	85.2	81.2	86.4	83.2	7549	86.2
2004	7883.0	890	99.5	84.6	99.5	82.3	100.8	84.3	8784	100.0
2005	6710.0	890	85.5	84.7	85.1	82.5	86.1	84.4	7656	87.4
2006	6928.8	890	87.7	84.8	87.2	82.8	88.9	84.7	7729	88.2

2007	7829.9	890	98.3	85.6	98.3	83.6	100.4	85.5	8631	98.5
2008	7280.0	908	91.3	85.8	91.3	84.0	91.3	85.8	8036	91.5
2009	7389.2	921	91.8	86.1	91.6	84.3	91.6	86.1	8074	92.2
2010	8056.9	922	99.8	86.8	99.8	85.1	99.8	86.7	8760	100.0
2011	6901.5	922	85.5	86.7	85.5	85.1	85.4	86.7	7581	86.5
2012	7185.0	922	89.1	86.8	88.7	85.2	88.7	86.7	7851	89.4
2013	8167.9	928	99.9	87.4	99.4	85.8	100.5	87.3	8728	99.6
2014	6708.5	928	81.4	87.1	81.4	85.6	82.5	87.1	7198	82.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		12			127	
C. Inspection, maintenance or repair combined with refuelling	1547			820	2	
D. Inspection, maintenance or repair without refuelling				10		
E. Testing of plant systems or components				1		
J. Grid limitation, failure or grid unavailability						39
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						8
Z. Other					1	
Subtotal	1547	12	0	831	130	47
Total		1559			1008	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems		27
16. Steam generation systems		6
31. Turbine and auxiliaries		17
32. Feedwater and Main Steam System		5
35. All other I&C Systems		4
41. Main Generator Systems	12	31
42. Electrical Power Supply Systems		17
Total	12	124



# UA-40 KHMELNITSKI-1

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 3551.7 GW(e)·h  
**Energy Availability Factor:** 48.6%  
**Load Factor:** 42.7%  
**Operating Factor:** 67.6%  
**Energy Unavailability Factor:** 51.4%  
**Total Off-line Time:** 2840 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	493.0	442.3	26.8	0.0	312.1	410.1	424.9	421.9	406.7	421.2	0.0	192.7	3551.7
<b>EAF (%)</b>	100.0	100.0	6.7	0.0	45.9	61.2	61.3	61.2	60.9	60.8	0.1	27.7	48.6
<b>UCF (%)</b>	100.0	100.0	6.7	0.0	45.9	61.2	61.3	61.2	60.9	60.8	0.1	27.7	48.6
<b>LF (%)</b>	69.7	69.3	3.8	0.0	44.2	60.0	60.1	59.7	59.5	59.5	0.0	27.3	42.7
<b>OF (%)</b>	100.0	100.0	7.0	0.0	76.1	100.0	100.0	100.0	100.0	100.0	0.3	28.4	67.6
<b>EUAF (%)</b>	0.0	0.0	93.3	100.0	54.1	38.8	38.7	38.8	39.1	39.2	99.9	72.3	51.4
<b>PUF (%)</b>	0.0	0.0	93.3	100.0	54.1	38.8	38.7	38.8	39.1	39.2	99.9	52.6	49.7
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.7	1.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 416 GW(E)H

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1981 **Lifetime Generation:** 156938.0 GW(e)·h  
**Date of First Criticality:** 10 Dec 1987 **Cumulative Energy Availability Factor:** 73.7%  
**Date of Grid Connection:** 31 Dec 1987 **Cumulative Load Factor:** 73.5%  
**Date of Commercial Operation:** 13 Aug 1988 **Cumulative Unit Capability Factor:** 74.6%  
**Cumulative Energy Unavailability Factor:** 26.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	2133.1	950	67.1	67.1	67.1	67.1	61.1	61.1	2753	75.0
1989	5872.3	950	70.7	69.6	70.6	69.6	70.6	67.8	6295	71.9
1990	6498.6	950	77.4	72.8	77.4	72.8	78.1	72.0	6870	78.4
1991	5172.5	950	61.2	69.4	61.2	69.4	62.2	69.1	5551	63.4
1992	6075.1	950	67.6	69.0	66.5	68.8	72.8	70.0	6167	70.2
1993	5487.7	950	65.2	68.3	65.2	68.1	65.9	69.2	5782	66.0
1994	6303.4	950	76.0	69.5	75.5	69.3	75.7	70.2	6775	77.3
1995	5700.3	950	68.0	69.3	68.0	69.1	68.5	70.0	6014	68.7
1996	4497.9	950	54.2	67.5	53.9	67.3	53.9	68.1	4854	55.3
1997	6152.1	950	72.8	68.1	72.6	67.8	73.9	68.7	6415	73.2
1998	5499.2	950	67.1	68.0	65.8	67.6	66.1	68.5	5904	67.4
1999	5526.7	950	66.8	67.9	66.4	67.5	66.4	68.3	6506	74.3
2000	5899.6	950	74.3	68.4	70.4	67.8	70.7	68.5	6541	74.5
2001	6167.3	950	76.5	69.0	73.6	68.2	73.9	68.9	6781	77.2
2002	6730.5	950	80.3	69.8	79.9	69.0	80.9	69.7	7049	80.5
2003	7137.7	950	85.4	70.8	84.9	70.0	85.8	70.8	7512	85.8
2004	6325.1	950	80.9	71.4	75.4	70.4	75.8	71.1	6935	79.0
2005	6862.8	950	84.9	72.2	84.8	71.2	82.5	71.7	7433	84.9
2006	6684.9	950	83.9	72.8	83.5	71.9	80.3	72.2	7407	84.6
2007	6905.3	950	83.1	73.3	83.0	72.4	83.0	72.7	7297	83.3
2008	6547.2	950	82.3	73.8	81.3	72.9	78.5	73.0	7237	82.4
2009	6380.6	950	80.0	74.1	77.8	73.1	76.7	73.2	7031	80.3

2010	6587.1	950	79.1	74.3	78.6	73.3	79.2	73.5	6966	79.5
2011	6967.3	950	82.6	74.7	82.6	73.7	83.7	73.9	7253	82.8
2012	7087.2	950	86.3	75.1	84.7	74.2	84.9	74.3	7592	86.4
2013	6877.2	950	87.5	75.6	87.4	74.7	82.6	74.7	7681	87.7
2014	3551.7	950	48.6	74.6	48.6	73.7	42.7	73.5	5920	67.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		147			178	
C. Inspection, maintenance or repair combined with refuelling	1589			1528		
D. Inspection, maintenance or repair without refuelling	1104			187		
E. Testing of plant systems or components				13		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						7
L. Human factor related					4	
Z. Other					0	
Subtotal	2693	147	0	1728	182	7
Total	2840			1917		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		22
13. Reactor Auxiliary Systems		9
14. Safety Systems		0
15. Reactor Cooling Systems		19
16. Steam generation systems	147	0
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		19
32. Feedwater and Main Steam System		10
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems		86
42. Electrical Power Supply Systems		4
Total	147	171

## UA-41 KHMELNITSKI-2

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6773.3 GW(e)·h  
**Energy Availability Factor:** 80.6%  
**Load Factor:** 81.4%  
**Operating Factor:** 81.3%  
**Energy Unavailability Factor:** 19.4%  
**Total Off-line Time:** 1639 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	720.3	649.6	712.3	686.4	708.7	682.7	693.9	233.7	0.0	264.9	699.0	721.8	6773.3
<b>EAF (%)</b>	100.0	100.0	100.0	99.9	99.5	99.2	97.7	33.6	0.0	38.5	100.0	100.0	80.6
<b>UCF (%)</b>	100.0	100.0	100.0	99.9	99.5	99.2	97.7	34.9	0.0	38.5	100.0	100.0	80.7
<b>LF (%)</b>	101.9	101.7	100.9	100.4	100.3	99.8	98.2	33.1	0.0	37.4	102.2	102.1	81.4
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	35.9	0.0	40.7	100.0	100.0	81.3
<b>EUf (%)</b>	0.0	0.0	0.0	0.1	0.5	0.8	2.4	66.4	100.0	61.5	0.0	0.0	19.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.1	0.5	0.8	2.4	65.2	100.0	61.5	0.0	0.0	19.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION-4 GW(E)H

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1985 **Lifetime Generation:** 64769.0 GW(e)·h  
**Date of First Criticality:** 01 Aug 2004 **Cumulative Energy Availability Factor:** 77.1%  
**Date of Grid Connection:** 07 Aug 2004 **Cumulative Load Factor:** 76.5%  
**Date of Commercial Operation:** 15 Dec 2005 **Cumulative Unit Capability Factor:** 78.3%  
**Cumulative Energy Unavailability Factor:** 22.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2005	261.4	950	100.0	100.0	100.0	100.0	37.0	37.0	296	39.8
2006	7178.3	950	87.4	88.4	86.2	87.2	86.3	82.4	7697	87.9
2007	7213.4	950	91.2	89.7	89.1	88.1	86.7	84.5	8008	91.4
2008	4944.8	950	59.7	80.0	59.6	78.9	59.3	76.3	5263	59.9
2009	5841.2	950	69.8	77.5	69.5	76.6	70.2	74.8	6126	69.9
2010	5873.7	950	69.7	75.9	69.6	75.2	70.6	74.0	6124	69.9
2011	6845.6	950	83.5	77.2	82.1	76.4	82.3	75.3	7333	83.7
2012	5917.7	950	76.3	77.1	71.0	75.6	70.9	74.7	6774	77.1
2013	7027.2	950	84.3	77.9	84.0	76.6	84.4	75.9	7391	84.4
2014	6773.3	950	80.7	78.3	80.6	77.1	81.4	76.5	7121	81.3

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2006 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					428	
C. Inspection, maintenance or repair combined with refuelling	1639			1082		
D. Inspection, maintenance or repair without refuelling				63		
R. External restrictions on supply and services (lack of funds due to delayed					138	

payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						
Subtotal	1639	0	0	1145	566	0
Total	1639			1711		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2006 to 2014 Average Hours Lost Per Year
14. Safety Systems		7
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		0
41. Main Generator Systems		418
Total	0	426

## UA-27 ROVNO-1

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 381.0 MW(e)  
**Design Net Capacity:** 361.0 MW(e)  
**Design Discharge Burnup:** 28600 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 2941.3 GW(e)·h  
**Energy Availability Factor:** 95.9%  
**Load Factor:** 88.1%  
**Operating Factor:** 91.9%  
**Energy Unavailability Factor:** 4.1%  
**Total Off-line Time:** 708 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	166.5	267.2	212.6	235.5	288.0	276.7	277.1	260.3	269.3	260.9	235.2	191.9	2941.3
<b>EAF (%)</b>	100.0	100.0	100.0	97.1	100.0	99.7	97.3	91.4	98.5	100.0	100.0	68.1	95.9
<b>UCF (%)</b>	100.0	100.0	100.0	97.1	100.0	100.0	99.6	93.3	99.4	100.0	100.0	73.7	96.9
<b>LF (%)</b>	58.8	104.4	75.1	85.9	101.6	100.9	97.8	91.8	98.2	91.9	85.8	67.7	88.1
<b>OF (%)</b>	58.5	100.0	80.9	97.2	100.0	100.0	100.0	94.0	100.0	100.0	100.0	74.2	91.9
<b>EUUF (%)</b>	0.0	0.0	0.0	2.9	0.0	0.3	2.7	8.6	1.5	0.0	0.0	31.9	4.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.4	6.7	0.6	0.0	0.0	26.3	2.9
<b>UCLF (%)</b>	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.3	2.3	1.9	0.9	0.0	0.0	5.6	0.9

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION-72 GW(E)H; RESERVE UNIT SHUTDOWNS AND REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 134 GW(E)H

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1973 **Lifetime Generation:** 83017.0 GW(e)·h  
**Date of First Criticality:** 17 Dec 1980 **Cumulative Energy Availability Factor:** 77.8%  
**Date of Grid Connection:** 22 Dec 1980 **Cumulative Load Factor:** 75.4%  
**Date of Commercial Operation:** 22 Sep 1981 **Cumulative Unit Capability Factor:** 78.5%  
**Cumulative Energy Unavailability Factor:** 22.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	932.3	361	91.0	91.0	91.0	91.0	88.2	88.2	2924	99.9
1982	1725.2	361	51.9	61.7	51.9	61.7	54.6	63.0	5498	62.8
1983	2036.6	361	61.6	61.7	61.6	61.7	64.4	63.6	6752	77.1
1984	2686.3	361	82.5	67.9	82.5	67.9	84.7	69.9	7782	88.6
1985	2664.8	365	81.4	71.1	81.4	71.1	83.3	73.1	7636	87.2
1986	2712.7	361	77.5	72.3	77.5	72.3	85.8	75.4	7606	86.8
1987	3040.8	402	86.6	74.7	86.6	74.7	86.3	77.3	7756	88.5
1988	2718.0	361	86.0	76.3	86.0	76.3	85.7	78.4	7877	89.7
1989	2823.8	361	89.2	77.8	89.2	77.8	89.3	79.7	7994	91.3
1990	2590.6	361	79.3	77.9	79.3	77.9	81.9	80.0	7265	82.9
1991	2640.1	361	81.4	78.3	81.4	78.3	83.5	80.3	7430	84.8
1992	3082.9	403	88.5	79.3	87.3	79.1	87.0	80.9	7989	90.9
1993	2584.4	406	83.0	79.6	81.4	79.3	72.7	80.2	7159	81.7
1994	2578.6	361	81.7	79.7	81.7	79.5	81.5	80.3	7378	84.2
1995	2747.4	361	88.4	80.3	86.1	80.0	86.9	80.8	7756	88.5
1996	2432.0	361	79.0	80.2	76.7	79.8	76.7	80.5	6960	79.2
1997	2701.1	361	82.2	80.4	81.6	79.9	85.4	80.8	7867	89.8
1998	2612.9	361	78.1	80.2	77.8	79.7	82.6	80.9	6912	78.9
1999	2240.5	361	82.8	80.4	82.8	79.9	70.8	80.4	6214	70.9
2000	2733.7	361	85.7	80.6	82.6	80.1	86.2	80.7	7580	86.3
2001	2753.8	381	82.6	80.7	81.4	80.1	82.3	80.7	7369	83.9

2002	2656.2	381	81.0	80.8	79.9	80.1	79.6	80.7	7242	82.7
2003	2816.1	381	84.5	80.9	83.5	80.3	84.4	80.9	7560	86.3
2004	2876.6	381	87.9	81.2	86.5	80.5	86.0	81.1	7914	90.1
2005	2362.6	381	85.8	81.4	84.5	80.7	70.8	80.6	7753	88.5
2006	2493.6	381	78.4	81.3	78.0	80.6	74.7	80.4	7012	80.0
2007	2079.0	381	66.3	80.7	65.7	80.0	62.3	79.7	5882	67.1
2008	2445.7	381	76.2	80.6	75.6	79.9	73.1	79.4	6815	77.6
2009	113.1	381	3.5	77.8	3.5	77.1	3.4	76.7	308	3.5
2010	2087.5	381	64.2	77.3	63.7	76.6	62.5	76.2	5572	63.6
2011	2517.1	381	81.9	77.5	81.7	76.8	75.4	76.2	6867	78.4
2012	2293.5	381	85.1	77.7	84.6	77.1	68.5	75.9	6596	75.1
2013	1507.6	381	83.6	77.9	82.8	77.2	45.2	75.0	4362	49.8
2014	2941.3	381	96.9	78.5	95.9	77.8	88.1	75.4	8052	91.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		19			41	
C. Inspection, maintenance or repair combined with refuelling	191			1385		
D. Inspection, maintenance or repair without refuelling	44			120		
J. Grid limitation, failure or grid unavailability						11
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			451			115
L. Human factor related					0	
M. Governmental requirements or court decisions					0	
Subtotal	235	19	451	1505	41	126
Total		705			1672	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		2
14. Safety Systems		0
15. Reactor Cooling Systems		12
16. Steam generation systems		7
17. Safety I&C Systems (excluding reactor I&C)	19	
32. Feedwater and Main Steam System		0
35. All other I&C Systems		0
41. Main Generator Systems		2
42. Electrical Power Supply Systems		5
XX. Miscellaneous Systems		0
Total	19	37

## UA-28 ROVNO-2

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 376.0 MW(e)  
**Design Net Capacity:** 384.0 MW(e)  
**Design Discharge Burnup:** 28600 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 2192.3 GW(e)·h  
**Energy Availability Factor:** 81.0%  
**Load Factor:** 66.6%  
**Operating Factor:** 75.1%  
**Energy Unavailability Factor:** 19.0%  
**Total Off-line Time:** 2181 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	117.5	0.0	67.3	82.5	110.0	258.1	185.9	275.7	271.7	252.4	281.5	289.7	2192.3
<b>EAF (%)</b>	41.8	0.0	38.2	92.6	100.0	98.7	98.5	97.3	99.3	100.0	100.0	100.0	81.0
<b>UCF (%)</b>	41.8	0.0	38.2	92.6	100.0	99.7	99.9	99.7	99.7	100.0	100.0	100.0	81.4
<b>LF (%)</b>	42.0	0.0	24.1	30.5	39.3	95.3	66.5	98.5	100.4	90.1	104.0	103.5	66.6
<b>OF (%)</b>	42.1	0.0	38.8	35.3	78.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	75.1
<b>EUf (%)</b>	58.2	100.0	61.8	7.4	0.0	1.3	1.5	2.7	0.7	0.0	0.0	0.0	19.0
<b>PUf (%)</b>	58.2	100.0	61.8	0.0	0.0	0.3	0.1	0.3	0.3	0.0	0.0	0.0	17.9
<b>UCLF (%)</b>	0.0	0.0	0.0	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	1.0	1.4	2.4	0.3	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION- 30 GW(E)H; RESERVE UNIT SHUTDOWNS AND REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 461 GW(E)H

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1973 **Lifetime Generation:** 84167.0 GW(e)·h  
**Date of First Criticality:** 19 Dec 1981 **Cumulative Energy Availability Factor:** 79.4%  
**Date of Grid Connection:** 22 Dec 1981 **Cumulative Load Factor:** 77.0%  
**Date of Commercial Operation:** 29 Jul 1982 **Cumulative Unit Capability Factor:** 80.5%  
**Cumulative Energy Unavailability Factor:** 20.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1982	1397.2	384	90.8	90.8	90.8	90.8	82.4	82.4	4403	99.7
1983	1926.9	384	58.0	69.0	58.0	69.0	57.3	65.7	5572	63.6
1984	2808.2	384	83.1	74.6	83.1	74.6	83.3	72.7	7884	89.8
1985	2913.5	384	86.0	77.9	86.0	77.9	86.6	76.7	7994	91.3
1986	2891.8	384	83.0	79.0	83.0	79.0	86.0	78.7	7819	89.3
1987	3166.4	416	86.3	80.4	86.3	80.4	86.9	80.3	7649	87.3
1988	2778.3	384	85.8	81.2	85.8	81.2	82.4	80.6	7875	89.7
1989	2700.4	384	86.3	81.9	86.3	81.9	80.3	80.6	7989	91.2
1990	2799.0	384	83.1	82.0	83.1	82.0	83.2	80.9	7815	89.2
1991	2393.2	384	71.0	80.9	71.0	80.9	71.1	79.9	6560	74.9
1992	2983.7	416	83.8	81.2	82.9	81.1	81.7	80.1	7487	85.2
1993	2053.7	406	66.0	79.8	64.4	79.6	57.7	78.0	5981	68.3
1994	2690.7	384	83.1	80.1	83.1	79.9	80.0	78.2	7626	87.1
1995	2568.5	384	79.6	80.0	76.4	79.6	76.4	78.1	7215	82.4
1996	2783.1	384	87.8	80.6	82.5	79.8	82.5	78.4	7905	90.0
1997	2585.6	384	77.6	80.4	76.5	79.6	76.9	78.3	6847	78.2
1998	2739.6	384	83.2	80.5	81.2	79.7	81.4	78.5	7424	84.7
1999	2543.7	384	78.0	80.4	75.5	79.5	75.6	78.3	6958	79.4
2000	2718.2	384	84.0	80.6	80.3	79.5	80.6	78.4	7460	84.9
2001	2796.9	376	86.6	80.9	83.2	79.7	84.7	78.7	7691	87.6
2002	2861.8	376	86.5	81.2	85.7	80.0	86.9	79.1	7756	88.5

2003	2784.2	376	82.6	81.2	81.6	80.0	84.5	79.4	7376	84.2
2004	2999.7	376	89.4	81.6	88.4	80.4	90.8	79.9	8047	91.6
2005	2549.0	376	86.5	81.8	86.0	80.6	77.4	79.8	7527	85.9
2006	2627.5	376	84.5	81.9	83.3	80.7	79.8	79.8	7727	88.2
2007	2082.9	376	63.7	81.2	62.8	80.1	63.2	79.1	5672	64.7
2008	2650.3	376	81.5	81.2	81.0	80.1	80.2	79.2	7203	82.0
2009	2536.9	376	85.6	81.4	84.8	80.3	77.0	79.1	7603	86.8
2010	1531.7	376	47.6	80.2	47.4	79.1	46.5	78.0	4270	48.7
2011	2211.8	376	78.7	80.1	77.7	79.1	67.2	77.6	6632	75.7
2012	2568.6	376	80.8	80.2	80.1	79.1	77.8	77.6	7115	81.0
2013	2246.8	376	88.6	80.4	88.3	79.4	68.2	77.3	5886	67.2
2014	2192.3	376	81.4	80.5	81.0	79.4	66.6	77.0	6579	75.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		35			116	
C. Inspection, maintenance or repair combined with refuelling	1557			1026		
D. Inspection, maintenance or repair without refuelling				232		
E. Testing of plant systems or components				0		
J. Grid limitation, failure or grid unavailability						10
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			587			60
L. Human factor related					0	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)					1	
Z. Other				33		
Subtotal	1557	35	587	1291	117	70
Total		2179			1478	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		14
13. Reactor Auxiliary Systems		2
15. Reactor Cooling Systems		6
16. Steam generation systems		72
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		12
41. Main Generator Systems		2
42. Electrical Power Supply Systems	35	5
Total	35	113



## UA-29 ROVNO-3

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 5545.2 GW(e)·h  
**Energy Availability Factor:** 70.3%  
**Load Factor:** 66.6%  
**Operating Factor:** 78.3%  
**Energy Unavailability Factor:** 29.7%  
**Total Off-line Time:** 1897 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	657.6	602.1	486.4	0.0	0.0	179.0	361.5	556.2	659.9	684.5	670.3	687.6	5545.2
<b>EAF (%)</b>	95.4	95.5	71.4	0.0	0.1	52.5	55.0	81.1	98.0	98.3	99.4	98.7	70.3
<b>UCF (%)</b>	95.8	96.0	86.4	0.0	0.1	53.7	55.0	81.7	99.4	99.5	99.5	99.3	72.1
<b>LF (%)</b>	93.0	94.3	68.9	0.0	0.0	26.2	51.1	78.7	96.5	96.7	98.0	97.3	66.6
<b>OF (%)</b>	100.0	100.0	87.3	0.0	0.4	61.1	96.8	94.9	100.0	100.0	100.0	100.0	78.3
<b>EUf (%)</b>	4.6	4.5	28.6	100.0	99.9	47.5	45.0	18.9	2.0	1.7	0.6	1.3	29.7
<b>PUf (%)</b>	4.2	4.0	13.6	100.0	99.9	46.3	45.0	18.3	0.7	0.5	0.5	0.7	27.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.5	0.5	15.0	0.0	0.0	1.2	0.0	0.6	1.3	1.1	0.0	0.6	1.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 165 GW(E)H

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1980 **Lifetime Generation:** 156633.0 GW(e)·h  
**Date of First Criticality:** 11 Nov 1986 **Cumulative Energy Availability Factor:** 70.4%  
**Date of Grid Connection:** 21 Dec 1986 **Cumulative Load Factor:** 67.6%  
**Date of Commercial Operation:** 16 May 1987 **Cumulative Unit Capability Factor:** 72.2%  
**Cumulative Energy Unavailability Factor:** 29.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	3961.1	1000	81.3	81.3	81.3	81.3	67.4	67.4	4474	76.1
1988	5661.3	950	71.1	75.3	71.1	75.3	67.8	67.6	6357	72.4
1989	6046.1	950	75.1	75.2	75.1	75.2	72.7	69.5	6771	77.3
1990	6360.1	950	77.3	75.8	77.3	75.8	76.4	71.4	6981	79.7
1991	5454.8	950	66.0	73.7	66.0	73.7	65.5	70.1	5971	68.2
1992	7084.9	1000	82.2	75.3	82.2	75.3	80.7	72.1	7323	83.4
1993	6195.1	950	76.5	75.5	75.9	75.4	74.4	72.4	6861	78.3
1994	5574.7	950	67.7	74.5	67.7	74.4	67.0	71.7	6042	69.0
1995	5018.3	950	61.0	72.9	60.3	72.8	60.3	70.4	5500	62.8
1996	5550.9	950	66.8	72.3	66.5	72.1	66.5	70.0	6064	69.0
1997	6249.6	950	75.9	72.6	74.7	72.4	75.1	70.5	6730	76.8
1998	5603.5	950	68.2	72.3	67.3	71.9	67.3	70.2	6036	68.9
1999	5303.5	950	72.6	72.3	63.7	71.3	63.7	69.7	6342	72.4
2000	4991.3	950	72.4	72.3	59.8	70.5	59.8	69.0	5641	64.2
2001	5783.6	950	75.3	72.5	69.6	70.4	69.3	69.0	6387	72.7
2002	5562.6	950	69.8	72.3	68.4	70.3	66.8	68.9	6320	72.1
2003	6250.5	950	75.2	72.5	74.3	70.5	75.1	69.2	6815	77.8
2004	6693.3	950	84.2	73.1	83.2	71.2	80.2	69.9	7321	83.3
2005	4768.1	950	69.7	73.0	68.3	71.1	57.3	69.2	6158	70.3
2006	4614.0	950	65.6	72.6	64.6	70.7	55.4	68.5	6777	77.4
2007	5317.2	950	67.4	72.3	66.8	70.5	63.9	68.3	6622	75.6
2008	6279.3	950	77.3	72.6	76.8	70.8	75.2	68.6	7097	80.8

2009	3135.0	950	46.4	71.4	42.0	69.6	37.7	67.2	4078	46.6
2010	5811.9	950	78.5	71.7	74.8	69.8	69.8	67.3	6731	76.8
2011	5945.2	950	75.7	71.9	75.2	70.0	71.4	67.5	7021	80.1
2012	5419.7	950	71.4	71.9	71.0	70.0	64.9	67.4	6665	75.9
2013	6064.6	950	81.2	72.2	80.2	70.4	72.9	67.6	7287	83.2
2014	5545.2	950	72.1	72.2	70.3	70.4	66.6	67.6	6863	78.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					250	
C. Inspection, maintenance or repair combined with refuelling	1555			1603		
D. Inspection, maintenance or repair without refuelling	342			224		
E. Testing of plant systems or components				20		
H. Nuclear regulatory requirements					13	
J. Grid limitation, failure or grid unavailability						5
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						16
L. Human factor related					6	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						6
Z. Other					2	26
Subtotal	1897	0	0	1847	271	53
Total	1897			2171		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		20
12. Reactor I&C Systems		24
13. Reactor Auxiliary Systems		10
15. Reactor Cooling Systems		5
16. Steam generation systems		23
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		32
32. Feedwater and Main Steam System		2
33. Circulating Water System		1
35. All other I&C Systems		1
41. Main Generator Systems		96
42. Electrical Power Supply Systems		28
Total	0	245

## UA-69 ROVNO-4

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6177.8 GW(e)·h  
**Energy Availability Factor:** 81.1%  
**Load Factor:** 74.2%  
**Operating Factor:** 80.8%  
**Energy Unavailability Factor:** 18.9%  
**Total Off-line Time:** 1684 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	407.1	481.7	639.1	658.0	673.2	0.0	0.0	549.1	680.6	704.1	679.2	705.7	6177.8
<b>EAF (%)</b>	100.0	100.0	98.8	97.4	96.3	0.4	0.0	81.4	100.0	100.0	100.0	100.0	81.1
<b>UCF (%)</b>	100.0	100.0	98.9	98.3	98.3	0.4	0.0	82.3	100.0	100.0	100.0	100.0	81.4
<b>LF (%)</b>	57.6	75.5	90.5	96.2	95.2	0.0	0.0	77.7	99.5	99.5	99.3	99.8	74.2
<b>OF (%)</b>	86.6	100.0	100.0	100.0	100.0	1.1	0.0	82.8	100.0	100.0	100.0	100.0	80.8
<b>EUf (%)</b>	0.0	0.0	1.2	2.6	3.7	99.6	100.0	18.6	0.0	0.0	0.0	0.0	18.9
<b>PUf (%)</b>	0.0	0.0	1.1	1.7	1.7	99.6	100.0	17.7	0.0	0.0	0.0	0.0	18.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.1	0.9	2.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION-18 GW(E)H; REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 471 GW(E)H

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1986 **Lifetime Generation:** 54704.0 GW(e)·h  
**Date of First Criticality:** 26 Sep 2004 **Cumulative Energy Availability Factor:** 73.0%  
**Date of Grid Connection:** 10 Oct 2004 **Cumulative Load Factor:** 65.4%  
**Date of Commercial Operation:** 06 Apr 2006 **Cumulative Unit Capability Factor:** 75.2%  
**Cumulative Energy Unavailability Factor:** 27.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
2006	3244.7	950	57.9	57.9	57.0	57.0	51.7	51.7	4326	65.5
2007	5560.9	950	69.6	64.6	69.5	64.1	66.8	60.3	7657	87.4
2008	4368.7	950	66.9	65.4	60.4	62.8	52.4	57.4	7058	80.4
2009	5402.7	950	72.8	67.4	68.9	64.4	64.9	59.4	8171	93.3
2010	6136.0	950	76.8	69.4	76.1	66.9	73.7	62.4	7001	79.9
2011	5471.0	950	77.1	70.7	75.0	68.3	65.7	63.0	6764	77.2
2012	6260.5	950	85.8	72.9	81.0	70.2	75.0	64.8	7558	86.0
2013	5045.4	950	84.7	74.5	83.7	71.9	60.6	64.3	7451	85.1
2014	6177.8	950	81.4	75.2	81.1	73.0	74.2	65.4	7076	80.8

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			2006 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					71	
C. Inspection, maintenance or repair combined with refuelling	1584			1053		
D. Inspection, maintenance or repair without refuelling				218		
H. Nuclear regulatory requirements					15	
J. Grid limitation, failure or grid						1

unavailability						
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			99			21
Subtotal	1584	0	99	1271	86	22
Total	1683			1379		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	2006 to 2014 Average Hours Lost Per Year
31. Turbine and auxiliaries		0
41. Main Generator Systems		71
Total	0	71

# UA-44 SOUTH UKRAINE-1

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6420.6 GW(e)·h  
**Energy Availability Factor:** 77.4%  
**Load Factor:** 77.2%  
**Operating Factor:** 86.2%  
**Energy Unavailability Factor:** 22.6%  
**Total Off-line Time:** 1213 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	701.5	636.1	692.3	622.5	648.9	523.8	559.9	535.0	230.2	0.0	582.0	688.4	6420.6
<b>EAF (%)</b>	97.4	97.9	97.3	92.8	90.2	84.8	78.2	75.9	36.7	0.0	83.1	95.7	77.4
<b>UCF (%)</b>	100.0	100.0	100.0	96.4	94.7	93.5	88.6	89.8	44.8	0.0	85.3	98.4	82.5
<b>LF (%)</b>	99.2	99.6	98.1	91.0	91.8	76.6	79.2	75.7	33.7	0.0	85.1	97.4	77.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	96.8	100.0	50.3	0.0	88.1	100.0	86.2
<b>EUf (%)</b>	2.6	2.1	2.7	7.2	9.8	15.2	21.8	24.1	63.3	100.0	16.9	4.3	22.6
<b>PUf (%)</b>	0.0	0.0	0.0	3.6	5.3	6.5	11.4	10.2	55.2	100.0	14.7	1.6	17.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	2.6	2.1	2.7	3.7	4.5	8.7	10.4	13.9	8.1	0.0	2.2	2.8	5.2

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 100 GW(E)H

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1976 **Lifetime Generation:** 165331.0 GW(e)·h  
**Date of First Criticality:** 09 Dec 1982 **Cumulative Energy Availability Factor:** 66.5%  
**Date of Grid Connection:** 31 Dec 1982 **Cumulative Load Factor:** 65.5%  
**Date of Commercial Operation:** 02 Dec 1983 **Cumulative Unit Capability Factor:** 68.0%  
**Cumulative Energy Unavailability Factor:** 33.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	676.7	950	95.2	95.2	95.2	95.2	95.7	95.7	709	95.3
1984	6075.1	950	71.7	73.5	71.7	73.5	72.8	74.6	6364	72.4
1985	6939.1	950	81.4	77.3	81.1	77.2	83.4	78.8	7148	81.6
1986	6176.1	950	74.1	76.3	73.5	76.0	74.2	77.3	6735	76.9
1987	6385.9	1000	75.6	76.1	75.6	75.9	72.9	76.2	6642	75.8
1988	5467.5	950	65.9	74.1	65.9	73.9	65.5	74.1	6177	70.3
1989	2501.6	950	30.8	67.1	30.8	66.9	30.1	66.9	3321	37.9
1990	6174.4	950	75.2	68.2	75.0	68.0	74.2	68.0	7063	80.6
1991	3865.9	950	46.5	65.5	46.5	65.4	46.4	65.3	5532	63.1
1992	4946.8	833	49.2	63.9	49.1	63.8	67.6	65.5	6142	69.9
1993	5277.8	950	62.3	63.8	61.4	63.6	63.4	65.3	5650	64.5
1994	5117.4	950	58.7	63.3	58.7	63.1	61.5	65.0	5667	64.7
1995	5438.6	950	66.1	63.5	65.4	63.3	65.4	65.0	6212	70.9
1996	5138.2	950	62.1	63.4	61.6	63.2	61.6	64.7	5549	63.2
1997	6196.1	950	73.0	64.1	72.5	63.8	74.5	65.4	6416	73.2
1998	6164.9	950	73.7	64.8	73.1	64.4	74.1	66.0	6477	73.9
1999	5558.9	950	67.1	64.9	66.5	64.6	66.8	66.1	5920	67.6
2000	5203.0	950	63.9	64.8	61.2	64.4	62.4	65.8	5677	64.6
2001	5563.7	950	68.3	65.0	66.6	64.5	66.7	65.9	6015	68.5
2002	4254.8	950	52.2	64.4	50.9	63.8	51.1	65.1	4625	52.8
2003	6008.2	950	74.2	64.9	72.6	64.2	72.2	65.5	6612	75.5
2004	6988.9	950	85.0	65.8	84.0	65.2	83.8	66.3	7592	86.4

2005	6068.5	950	78.3	66.4	77.1	65.7	72.9	66.6	6926	79.1
2006	6345.1	950	79.1	66.9	76.9	66.2	76.2	67.1	6988	79.8
2007	5159.8	950	62.7	66.8	61.6	66.0	62.0	66.8	5562	63.5
2008	6895.4	950	85.1	67.5	84.8	66.8	82.6	67.5	7484	85.2
2009	3790.6	950	78.3	67.9	74.2	67.0	45.5	66.6	5368	61.3
2010	5151.4	950	90.6	68.7	84.6	67.7	61.9	66.5	6335	72.3
2011	5026.8	950	72.0	68.9	60.3	67.4	60.4	66.2	6632	75.7
2012	6524.1	950	77.8	69.2	74.6	67.7	78.2	66.7	7508	85.5
2013	1765.5	950	20.6	67.6	20.1	66.1	21.2	65.1	1987	22.7
2014	6420.6	950	82.5	68.0	77.4	66.5	77.2	65.5	7547	86.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					330	
C. Inspection, maintenance or repair combined with refuelling	1189			1552		
D. Inspection, maintenance or repair without refuelling	23			293		
E. Testing of plant systems or components				8	0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						114
L. Human factor related					1	
Z. Other					30	0
Subtotal	1212	0	0	1853	361	114
Total	1212			2328		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		9
14. Safety Systems		0
15. Reactor Cooling Systems		4
16. Steam generation systems		162
31. Turbine and auxiliaries		47
32. Feedwater and Main Steam System		6
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems		95
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		0
Total	0	324

## UA-45 SOUTH UKRAINE-2

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6152.4 GW(e)·h  
**Energy Availability Factor:** 73.5%  
**Load Factor:** 73.9%  
**Operating Factor:** 78.2%  
**Energy Unavailability Factor:** 26.5%  
**Total Off-line Time:** 1914 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	692.1	604.9	685.5	610.1	660.0	308.8	0.0	0.0	519.4	708.0	688.2	675.4	6152.4
<b>EAF (%)</b>	95.3	93.8	95.4	94.2	91.8	47.6	0.0	0.0	82.6	95.8	95.9	92.0	73.5
<b>UCF (%)</b>	98.2	96.2	98.5	97.3	95.9	50.6	0.0	0.0	88.7	99.0	98.9	94.4	76.2
<b>LF (%)</b>	97.9	94.7	97.1	89.2	93.4	45.1	0.0	0.0	75.9	100.0	100.6	95.6	73.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	53.6	0.0	0.0	91.3	100.0	100.0	96.1	78.2
<b>EUUF (%)</b>	4.7	6.2	4.6	5.8	8.2	52.4	100.0	100.0	17.4	4.2	4.1	8.0	26.5
<b>PUF (%)</b>	1.8	3.8	1.5	2.7	4.2	49.5	100.0	100.0	11.3	1.0	1.1	1.4	23.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	0.4
<b>XUF (%)</b>	2.9	2.4	3.1	3.2	4.1	2.9	0.0	0.0	6.1	3.2	3.1	2.4	2.8

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 170 GW(E)H

### 5. Historical Summary

**Date of Construction Start:** 01 Jul 1981 **Lifetime Generation:** 158973.0 GW(e)·h  
**Date of First Criticality:** 30 Dec 1984 **Cumulative Energy Availability Factor:** 65.5%  
**Date of Grid Connection:** 06 Jan 1985 **Cumulative Load Factor:** 65.4%  
**Date of Commercial Operation:** 06 Apr 1985 **Cumulative Unit Capability Factor:** 67.0%  
**Cumulative Energy Unavailability Factor:** 34.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	4666.7	950	73.3	73.3	73.3	73.3	74.4	74.4	4924	74.6
1986	5565.5	950	67.0	69.7	66.2	69.3	66.9	70.1	6315	72.1
1987	1641.7	1000	22.0	51.8	22.0	51.6	18.7	50.8	1941	22.2
1988	4850.6	950	57.4	53.3	57.4	53.1	58.1	52.8	5198	59.2
1989	4437.3	950	54.3	53.5	54.3	53.3	53.3	52.9	6674	76.2
1990	1769.0	950	21.9	48.1	21.9	47.9	21.3	47.4	4522	51.6
1991	6209.8	950	72.0	51.6	72.0	51.5	74.6	51.4	6722	76.7
1992	6412.1	1000	72.9	54.4	71.7	54.2	73.0	54.3	6574	74.8
1993	5204.0	950	64.0	55.5	61.7	55.0	62.5	55.2	6570	75.0
1994	3958.5	950	47.3	54.7	46.9	54.2	47.6	54.5	6471	73.9
1995	5429.4	950	66.1	55.7	65.2	55.2	65.2	55.5	6514	74.4
1996	4593.7	950	55.4	55.7	55.0	55.2	55.0	55.4	5590	63.6
1997	6326.5	950	77.2	57.4	75.4	56.8	76.0	57.0	7400	84.5
1998	4542.4	950	55.1	57.2	54.0	56.6	54.6	56.9	4867	55.6
1999	5537.9	950	72.0	58.2	66.4	57.2	66.5	57.5	6372	72.7
2000	4103.5	950	50.0	57.7	49.2	56.7	49.2	57.0	4486	51.1
2001	6206.5	950	74.8	58.7	74.4	57.8	74.4	58.0	6869	78.2
2002	6057.2	950	74.2	59.6	72.7	58.6	72.8	58.8	6565	74.9
2003	5507.7	950	66.2	59.9	65.8	59.0	66.2	59.2	5868	67.0
2004	6899.7	950	86.1	61.2	82.2	60.2	82.7	60.4	7647	87.1
2005	6479.2	950	82.0	62.2	81.1	61.2	77.9	61.2	7243	82.7
2006	6110.2	950	77.5	62.9	75.3	61.8	73.4	61.8	6847	78.2

2007	6241.7	950	78.0	63.6	75.8	62.4	75.0	62.4	6892	78.7
2008	6623.6	950	81.4	64.3	81.1	63.2	79.4	63.1	7248	82.5
2009	6402.8	950	81.6	65.0	81.0	63.9	76.9	63.6	7213	82.3
2010	6461.5	950	79.4	65.6	77.7	64.4	77.6	64.2	7326	83.6
2011	6039.1	950	77.0	66.0	72.9	64.8	72.6	64.5	7003	79.9
2012	6003.0	950	74.3	66.3	70.7	65.0	71.9	64.8	6723	76.5
2013	6141.2	950	75.6	66.6	73.0	65.3	73.8	65.1	7160	81.7
2014	6152.4	950	76.2	67.0	73.5	65.5	73.9	65.4	6846	78.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		29			420	
C. Inspection, maintenance or repair combined with refuelling	1885			1387		
D. Inspection, maintenance or repair without refuelling				383		
E. Testing of plant systems or components				9		
H. Nuclear regulatory requirements					4	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						4
L. Human factor related					1	
Z. Other					51	
Subtotal	1885	29	0	1779	476	4
Total		1914			2259	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		7
14. Safety Systems		0
15. Reactor Cooling Systems		24
16. Steam generation systems		317
17. Safety I&C Systems (excluding reactor I&C)		8
31. Turbine and auxiliaries	29	19
32. Feedwater and Main Steam System		28
41. Main Generator Systems		7
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		4
Total	29	415



## UA-48 SOUTH UKRAINE-3

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 5911.1 GW(e)·h  
**Energy Availability Factor:** 87.4%  
**Load Factor:** 71.0%  
**Operating Factor:** 77.4%  
**Energy Unavailability Factor:** 12.6%  
**Total Off-line Time:** 1979 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	706.4	639.2	556.7	261.1	0.0	397.7	684.1	680.4	542.4	709.3	616.7	117.2	5911.1
<b>EAF (%)</b>	97.4	97.8	96.4	97.2	100.0	95.9	93.1	92.8	78.7	95.7	88.2	16.7	87.4
<b>UCF (%)</b>	99.6	99.7	98.6	98.3	100.0	99.5	99.1	98.5	98.4	98.8	98.7	22.6	92.5
<b>LF (%)</b>	99.9	100.1	78.9	38.2	0.0	58.1	96.8	96.3	79.3	100.2	90.2	16.6	71.0
<b>OF (%)</b>	100.0	100.0	99.3	40.4	0.0	68.5	100.0	100.0	100.0	100.0	100.0	22.8	77.4
<b>EUf (%)</b>	2.6	2.2	3.6	2.8	0.0	4.1	6.9	7.2	21.3	4.3	11.8	83.3	12.6
<b>PUf (%)</b>	0.4	0.3	1.4	1.7	0.0	0.5	0.9	1.5	1.6	1.2	1.3	77.4	7.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	2.1	1.9	2.2	1.1	0.0	3.5	6.0	5.8	19.7	3.1	10.5	5.9	5.1

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: RESERVE UNIT SHUTDOWNS AND REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 1 543 GW(E)H

### 5. Historical Summary

**Date of Construction Start:** 01 Nov 1984 **Lifetime Generation:** 136187.0 GW(e)·h  
**Date of First Criticality:** 02 Sep 1989 **Cumulative Energy Availability Factor:** 70.0%  
**Date of Grid Connection:** 20 Sep 1989 **Cumulative Load Factor:** 67.7%  
**Date of Commercial Operation:** 29 Dec 1989 **Cumulative Unit Capability Factor:** 72.4%  
**Cumulative Energy Unavailability Factor:** 30.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	501.9	950	100.0	100.0	100.0	100.0	71.0	71.0	563	75.7
1990	5691.6	950	69.4	71.8	69.4	71.8	68.4	68.6	6408	73.2
1991	5762.8	950	70.4	71.1	70.0	70.9	69.2	68.9	6996	79.9
1992	6458.1	1000	75.2	72.5	75.2	72.4	73.5	70.5	6646	75.7
1993	6043.4	950	72.8	72.6	71.7	72.2	72.6	71.0	6527	74.5
1994	5565.0	950	66.5	71.4	66.4	71.1	66.9	70.2	6223	71.0
1995	4954.8	950	60.2	69.6	59.5	69.2	59.5	68.4	6300	71.9
1996	6155.0	950	76.4	70.5	73.8	69.8	73.8	69.2	7463	85.0
1997	6514.8	950	79.7	71.7	77.7	70.8	78.3	70.3	7079	80.8
1998	5851.0	950	71.0	71.6	69.9	70.7	70.3	70.3	6396	73.0
1999	5464.3	950	67.2	71.1	65.5	70.2	65.7	69.9	6244	71.3
2000	5909.7	950	73.3	71.3	70.6	70.2	70.8	69.9	6588	75.0
2001	6136.3	950	76.3	71.8	73.7	70.5	73.5	70.2	6985	79.5
2002	6335.2	950	77.5	72.2	76.0	70.9	76.1	70.7	7043	80.4
2003	6036.5	950	74.3	72.3	73.1	71.1	72.5	70.8	6680	76.3
2004	6625.1	950	82.0	73.0	79.9	71.7	79.4	71.4	7246	82.5
2005	6801.0	950	85.7	73.8	85.0	72.5	81.7	72.0	7548	86.2
2006	4290.9	950	53.6	72.6	53.0	71.4	51.6	70.8	4734	54.0
2007	5326.1	950	67.3	72.3	66.1	71.1	64.0	70.5	5978	68.2
2008	4560.8	950	59.7	71.6	58.6	70.4	54.7	69.6	5961	67.9
2009	5343.1	950	82.6	72.2	74.6	70.6	64.2	69.4	7024	80.2

2010	5243.2	950	75.4	72.3	62.9	70.3	63.0	69.1	6778	77.4
2011	5372.6	950	72.0	72.3	65.2	70.0	64.6	68.9	6404	73.1
2012	4058.4	950	49.7	71.3	48.5	69.1	48.6	68.0	4448	50.6
2013	4731.1	950	75.6	71.5	73.0	69.3	56.9	67.5	6704	76.5
2014	5911.1	950	92.5	72.4	87.4	70.0	71.0	67.7	6781	77.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					242	
C. Inspection, maintenance or repair combined with refuelling	573			1587		
D. Inspection, maintenance or repair without refuelling	12			263		
E. Testing of plant systems or components				15		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			1391			26
L. Human factor related					0	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					19	
Subtotal	585	0	1391	1865	261	26
Total	1976			2152		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		1
16. Steam generation systems		5
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		19
32. Feedwater and Main Steam System		0
33. Circulating Water System		0
35. All other I&C Systems		1
41. Main Generator Systems		200
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		2
Total	0	237

# UA-54 ZAPOROZHYE-1

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 5661.6 GW(e)·h  
**Energy Availability Factor:** 70.2%  
**Load Factor:** 68.0%  
**Operating Factor:** 73.0%  
**Energy Unavailability Factor:** 29.8%  
**Total Off-line Time:** 2363 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	702.5	634.2	698.4	615.3	678.1	635.8	591.7	648.3	105.7	0.0	0.0	351.8	5661.6
<b>EAF (%)</b>	98.4	98.3	97.2	96.3	94.5	93.8	93.2	92.4	22.1	0.0	0.0	56.5	70.2
<b>UCF (%)</b>	99.1	98.9	98.4	98.2	97.7	97.7	97.6	97.4	22.8	0.0	0.0	57.0	72.0
<b>LF (%)</b>	99.4	99.3	98.9	90.0	95.9	92.9	83.7	91.7	15.4	0.0	0.0	49.8	68.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	17.8	0.0	0.0	58.9	73.0
<b>EUf (%)</b>	1.6	1.7	2.8	3.7	5.5	6.3	6.8	7.6	77.9	100.0	100.0	43.5	29.8
<b>PUf (%)</b>	1.0	1.1	1.6	1.8	2.3	2.3	2.4	2.6	77.2	100.0	100.0	43.0	28.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.6	0.6	1.2	1.9	3.3	3.9	4.4	5.0	0.8	0.0	0.0	0.5	1.8

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION-43 GW(E)H; REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 210 GW(E)H

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1980 **Lifetime Generation:** 156579.0 GW(e)·h  
**Date of First Criticality:** 07 Dec 1984 **Cumulative Energy Availability Factor:** 65.9%  
**Date of Grid Connection:** 10 Dec 1984 **Cumulative Load Factor:** 65.1%  
**Date of Commercial Operation:** 25 Dec 1985 **Cumulative Unit Capability Factor:** 68.0%  
**Cumulative Energy Unavailability Factor:** 34.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	495.0	950	70.8	70.8	70.8	70.8	70.0	70.0	594	79.8
1986	4826.3	950	61.5	62.3	58.3	59.2	58.0	58.9	5580	63.7
1987	6720.9	1000	80.8	71.4	80.8	69.9	76.7	67.7	7205	82.2
1988	5170.4	950	67.4	70.1	67.2	69.0	62.0	65.9	6225	70.9
1989	0.0	950	0.0	53.2	0.0	52.3	0.0	50.0	0	0.0
1990	4668.7	950	58.8	54.3	56.4	53.1	56.1	51.2	5684	64.9
1991	5332.2	950	68.5	56.6	64.2	54.9	64.1	53.3	6343	72.4
1992	6103.5	950	70.3	58.5	67.8	56.8	73.1	56.0	6739	76.7
1993	4209.7	950	53.5	57.9	52.1	56.2	50.6	55.4	6591	75.2
1994	3771.0	950	45.5	56.5	45.5	55.0	45.3	54.3	5062	57.8
1995	3557.3	950	44.9	55.4	42.7	53.8	42.7	53.1	4213	48.1
1996	4299.5	950	53.5	55.2	51.5	53.6	51.5	53.0	5224	59.5
1997	4070.6	950	53.9	55.1	48.9	53.2	48.9	52.7	5531	63.1
1998	5517.5	950	68.7	56.1	66.3	54.2	66.3	53.7	6122	69.9
1999	5992.5	950	84.0	58.1	72.0	55.5	72.0	55.0	7422	84.7
2000	4222.7	950	52.0	57.7	50.3	55.1	50.6	54.7	4589	52.2
2001	5847.1	950	71.8	58.6	69.9	56.0	70.1	55.7	6434	73.2
2002	6735.0	950	83.2	60.0	80.6	57.5	80.9	57.1	7334	83.7
2003	6596.4	950	81.9	61.2	79.0	58.7	79.3	58.3	7223	82.5
2004	6748.3	950	82.6	62.3	80.6	59.8	80.9	59.5	7290	83.0
2005	6018.8	950	77.8	63.1	76.8	60.6	72.3	60.2	6823	77.9

2006	6899.0	950	83.7	64.1	83.3	61.7	82.9	61.2	7380	84.2
2007	6921.0	950	83.6	65.0	83.5	62.7	83.2	62.2	7406	84.5
2008	6227.7	950	81.4	65.7	80.3	63.5	74.6	62.8	6748	76.8
2009	6584.4	950	83.4	66.4	82.4	64.2	79.1	63.4	7174	81.9
2010	6586.8	950	83.3	67.1	81.9	64.9	79.1	64.1	7396	84.4
2011	6095.1	950	75.3	67.4	74.1	65.3	73.2	64.4	6702	76.5
2012	6191.1	950	75.6	67.7	73.4	65.6	74.2	64.8	6765	77.0
2013	5816.7	950	72.5	67.9	70.7	65.8	69.9	65.0	6585	75.2
2014	5661.6	950	72.0	68.0	70.2	65.9	68.0	65.1	6397	73.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					259	
C. Inspection, maintenance or repair combined with refuelling	2324			1536	26	
D. Inspection, maintenance or repair without refuelling				563		
E. Testing of plant systems or components				5		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			40			22
L. Human factor related					8	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						6
Z. Other					2	
Subtotal	2324	0	40	2104	295	28
Total	2364			2427		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		37
15. Reactor Cooling Systems		25
16. Steam generation systems		70
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries		41
32. Feedwater and Main Steam System		24
35. All other I&C Systems		0
41. Main Generator Systems		28
42. Electrical Power Supply Systems		11
XX. Miscellaneous Systems		12
Total	0	254

## UA-56 ZAPOROZHYE-2

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6307.7 GW(e)·h  
**Energy Availability Factor:** 73.6%  
**Load Factor:** 75.8%  
**Operating Factor:** 77.8%  
**Energy Unavailability Factor:** 26.4%  
**Total Off-line Time:** 1949 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	0.0	0.0	173.4	683.9	690.1	663.1	677.6	673.8	666.6	703.2	674.3	701.8	6307.7
<b>EAF (%)</b>	0.0	0.0	26.4	96.1	94.4	93.6	92.4	92.3	95.1	95.8	95.4	96.9	73.6
<b>UCF (%)</b>	0.0	0.0	26.8	98.2	97.8	97.6	97.1	97.1	97.4	97.9	96.6	97.9	75.7
<b>LF (%)</b>	0.0	0.0	24.6	100.0	97.6	96.9	95.9	95.3	97.5	99.4	98.6	99.3	75.8
<b>OF (%)</b>	0.0	0.0	28.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.8
<b>EUf (%)</b>	100.0	100.0	73.6	3.9	5.6	6.4	7.6	7.7	4.9	4.2	4.6	3.1	26.4
<b>PUf (%)</b>	100.0	100.0	73.2	1.8	2.2	2.4	2.9	2.9	2.6	2.1	2.3	2.1	24.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.1
<b>XUF (%)</b>	0.0	0.0	0.4	2.1	3.4	4.0	4.7	4.8	2.3	2.1	1.2	1.0	2.2

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1981  
**Date of First Criticality:** 28 Jun 1985  
**Date of Grid Connection:** 22 Jul 1985  
**Date of Commercial Operation:** 15 Feb 1986

**Lifetime Generation:** 160641.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 70.6%  
**Cumulative Load Factor:** 68.0%  
**Cumulative Unit Capability Factor:** 72.3%  
**Cumulative Energy Unavailability Factor:** 29.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	5112.9	950	70.9	70.9	68.4	68.4	67.1	67.1	5764	71.9
1987	6058.3	1000	76.0	73.6	76.0	72.5	69.2	68.2	6675	76.2
1988	6088.6	950	81.2	76.2	81.2	75.4	73.0	69.8	7253	82.6
1989	3050.9	950	45.1	68.4	45.1	67.8	36.7	61.5	3393	38.7
1990	1869.1	950	22.6	59.1	22.3	58.6	22.5	53.6	2165	24.7
1991	4583.9	950	56.1	58.6	55.4	58.1	55.1	53.9	5112	58.4
1992	6551.7	950	77.7	61.4	76.2	60.7	78.5	57.4	7016	79.9
1993	4386.1	950	56.6	60.8	53.8	59.8	52.7	56.8	6194	70.7
1994	4103.5	950	49.9	59.6	49.8	58.7	49.3	56.0	5924	67.6
1995	5051.8	950	63.5	60.0	60.7	58.9	60.7	56.5	7329	83.7
1996	5373.0	950	67.5	60.6	64.4	59.4	64.4	57.2	6247	71.1
1997	6081.7	950	76.5	62.0	73.0	60.6	73.1	58.5	6745	77.0
1998	4922.8	950	62.9	62.0	59.0	60.4	59.2	58.6	5601	63.9
1999	5476.0	950	66.9	62.4	65.7	60.8	65.8	59.1	5887	67.2
2000	5626.4	950	70.7	63.0	67.4	61.3	67.4	59.6	6281	71.5
2001	5867.6	950	72.5	63.6	70.6	61.8	70.3	60.3	6422	73.1
2002	6315.6	950	78.8	64.5	75.9	62.7	75.9	61.2	6834	78.0
2003	6742.4	950	83.8	65.5	80.9	63.7	81.0	62.3	7387	84.3
2004	6944.3	950	86.0	66.6	83.1	64.7	83.2	63.4	7531	85.7
2005	6303.2	950	83.4	67.4	82.4	65.6	75.7	64.0	7332	83.7
2006	6644.7	950	83.0	68.2	82.8	66.4	79.8	64.8	7297	83.3
2007	7064.5	950	85.3	69.0	85.1	67.3	84.9	65.7	7528	85.9
2008	6763.5	950	84.6	69.6	84.3	68.0	81.1	66.4	7470	85.0
2009	6127.9	950	81.8	70.2	80.9	68.5	73.6	66.7	7206	82.3

2010	6674.4	950	81.4	70.6	79.8	69.0	80.2	67.2	7180	82.0
2011	6155.3	950	77.4	70.9	75.1	69.2	74.0	67.5	6881	78.6
2012	6046.8	950	80.2	71.2	77.8	69.5	72.5	67.7	7202	82.0
2013	5857.3	950	97.3	72.1	95.1	70.5	70.4	67.8	7464	85.2
2014	6307.7	950	75.7	72.3	73.6	70.6	75.8	68.0	6811	77.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					316	
C. Inspection, maintenance or repair combined with refuelling	1949			1399		
D. Inspection, maintenance or repair without refuelling				399		
E. Testing of plant systems or components				4		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						47
L. Human factor related					3	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						5
Z. Other					1	
Subtotal	1949	0	0	1802	320	52
Total	1949			2174		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		7
16. Steam generation systems		191
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		6
35. All other I&C Systems		6
41. Main Generator Systems		52
42. Electrical Power Supply Systems		3
XX. Miscellaneous Systems		8
Total	0	312

# UA-78 ZAPOROZHYE-3

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6280.0 GW(e)·h  
**Energy Availability Factor:** 79.2%  
**Load Factor:** 75.5%  
**Operating Factor:** 81.7%  
**Energy Unavailability Factor:** 20.8%  
**Total Off-line Time:** 1601 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	564.1	642.9	486.3	0.0	143.3	632.4	586.3	634.8	643.5	708.5	641.3	596.6	6280.0
<b>EAF (%)</b>	99.0	98.8	70.9	0.0	29.9	95.6	95.0	94.4	96.1	97.4	91.1	82.8	79.2
<b>UCF (%)</b>	99.2	99.2	71.6	0.0	30.8	99.1	98.9	98.9	99.1	99.3	92.1	83.5	80.9
<b>LF (%)</b>	79.8	100.7	68.9	0.0	20.3	92.5	82.9	89.8	94.1	100.1	93.8	84.4	75.5
<b>OF (%)</b>	100.0	100.0	72.8	0.0	31.6	100.0	100.0	100.0	100.0	100.0	92.6	84.3	81.7
<b>EUf (%)</b>	1.0	1.2	29.1	100.0	70.1	4.4	5.0	5.6	3.9	2.6	8.9	17.2	20.8
<b>PUf (%)</b>	0.8	0.8	28.4	100.0	69.2	0.9	1.1	1.1	0.9	0.7	0.6	0.6	17.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4	15.9	2.0
<b>XUF (%)</b>	0.2	0.5	0.7	0.0	0.9	3.5	3.9	4.5	3.0	1.9	1.0	0.7	1.7

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION-38 GW(E)H; REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 342 GW(E)H

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1982 **Lifetime Generation:** 157214.0 GW(e)·h  
**Date of First Criticality:** 04 Dec 1986 **Cumulative Energy Availability Factor:** 72.3%  
**Date of Grid Connection:** 10 Dec 1986 **Cumulative Load Factor:** 69.9%  
**Date of Commercial Operation:** 05 Mar 1987 **Cumulative Unit Capability Factor:** 75.2%  
**Cumulative Energy Unavailability Factor:** 27.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	5757.0	1000	80.3	80.3	80.3	80.3	78.4	78.4	5886	80.1
1988	6414.3	950	81.3	80.9	81.3	80.9	76.9	77.6	7077	80.6
1989	6614.4	950	80.9	80.9	80.9	80.9	79.5	78.2	7373	84.2
1990	5625.3	950	68.1	77.6	67.7	77.5	67.6	75.5	6166	70.4
1991	4958.8	950	61.1	74.2	59.9	73.9	59.6	72.2	5877	67.1
1992	4140.9	950	54.0	70.8	50.5	69.9	49.6	68.4	5274	60.0
1993	5416.6	950	67.6	70.3	66.0	69.3	65.1	67.9	7263	82.9
1994	4273.7	950	52.5	68.0	52.5	67.2	51.4	65.8	6068	69.3
1995	4027.8	950	49.7	66.0	48.4	65.1	48.4	63.9	5804	66.3
1996	4940.2	950	62.3	65.6	59.2	64.5	59.2	63.4	6096	69.4
1997	4869.8	950	70.1	66.0	58.5	63.9	58.5	62.9	6544	74.7
1998	4953.2	950	63.1	65.8	59.5	63.6	59.5	62.6	6316	72.1
1999	5114.5	950	64.7	65.7	61.5	63.4	61.5	62.6	6162	70.3
2000	6123.2	950	76.6	66.5	73.0	64.1	73.4	63.3	6875	78.3
2001	6307.8	950	80.9	67.5	75.7	64.9	75.6	64.2	7027	80.0
2002	6602.0	950	84.4	68.5	79.2	65.8	79.3	65.1	7470	85.3
2003	6588.9	950	81.9	69.3	79.0	66.6	79.2	65.9	7236	82.6
2004	6308.7	950	85.4	70.2	75.5	67.1	75.6	66.5	7371	83.9
2005	6224.1	950	84.4	71.0	83.5	67.9	74.8	66.9	7229	82.5
2006	6048.0	950	84.8	71.7	83.3	68.7	72.7	67.2	7031	80.3
2007	6631.4	950	81.7	72.1	80.5	69.3	79.7	67.8	7268	83.0

2008	6843.2	950	85.3	72.7	83.7	69.9	82.0	68.5	7589	86.4
2009	6504.3	950	93.2	73.6	88.9	70.8	78.2	68.9	7996	91.3
2010	6319.9	950	82.7	74.0	78.3	71.1	75.9	69.2	7341	83.8
2011	6791.7	950	84.7	74.4	82.6	71.5	81.6	69.7	7569	86.4
2012	6178.4	950	78.4	74.6	76.0	71.7	74.0	69.8	6984	79.5
2013	5420.5	950	83.6	74.9	81.5	72.1	65.1	69.7	6518	74.4
2014	6280.0	950	80.9	75.2	79.2	72.3	75.5	69.9	7159	81.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		170			71	
C. Inspection, maintenance or repair combined with refuelling	1432			1403		
D. Inspection, maintenance or repair without refuelling				179		
E. Testing of plant systems or components				16	2	
J. Grid limitation, failure or grid unavailability						9
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						67
L. Human factor related					6	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						9
Z. Other				1	3	
Subtotal	1432	170	0	1599	82	85
Total		1602			1766	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		2
14. Safety Systems		4
15. Reactor Cooling Systems		0
16. Steam generation systems		11
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		10
33. Circulating Water System		0
35. All other I&C Systems		1
41. Main Generator Systems		23
42. Electrical Power Supply Systems	170	3
XX. Miscellaneous Systems		6
Total	170	66



# UA-79 ZAPOROZHYE-4

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6582.8 GW(e)·h  
**Energy Availability Factor:** 80.9%  
**Load Factor:** 79.1%  
**Operating Factor:** 84.2%  
**Energy Unavailability Factor:** 19.1%  
**Total Off-line Time:** 1385 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	655.1	630.7	681.0	673.8	0.0	21.1	626.5	622.4	633.5	694.4	682.4	662.0	6582.8
<b>EAF (%)</b>	98.9	98.3	97.3	96.1	0.5	9.3	93.0	92.4	94.4	96.0	97.5	97.8	80.9
<b>UCF (%)</b>	99.2	98.9	98.4	98.0	0.5	9.5	97.1	96.9	97.6	98.1	98.5	98.9	82.6
<b>LF (%)</b>	92.7	98.8	96.5	98.5	0.0	3.1	88.6	88.1	92.6	98.1	99.8	93.7	79.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	0.9	10.0	100.0	100.0	100.0	100.0	100.0	100.0	84.2
<b>EUf (%)</b>	1.1	1.7	2.7	3.9	99.5	90.7	7.0	7.6	5.6	4.0	2.5	2.2	19.1
<b>PUf (%)</b>	0.8	1.1	1.6	2.0	99.5	90.5	2.9	3.1	2.4	1.9	1.5	1.1	17.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.3	0.6	1.1	1.9	0.0	0.2	4.1	4.5	3.2	2.1	1.0	1.1	1.7

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION-79 GW(E)H; REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 174 GW(E)H

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1983 **Lifetime Generation:** 158724.0 GW(e)·h  
**Date of First Criticality:** 15 Dec 1987 **Cumulative Energy Availability Factor:** 75.2%  
**Date of Grid Connection:** 18 Dec 1987 **Cumulative Load Factor:** 73.3%  
**Date of Commercial Operation:** 14 Apr 1988 **Cumulative Unit Capability Factor:** 77.5%  
**Cumulative Energy Unavailability Factor:** 24.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	4798.9	950	79.1	79.1	79.1	79.1	76.5	76.5	5278	80.0
1989	5828.1	950	73.1	75.7	73.1	75.7	70.0	72.8	6613	75.5
1990	6637.3	950	79.8	77.2	78.9	76.8	79.8	75.3	7393	84.4
1991	4259.5	950	51.3	70.3	51.1	70.0	51.2	68.9	5114	58.4
1992	6962.3	1000	78.8	72.1	78.6	71.8	79.3	71.2	6961	79.2
1993	6118.8	950	74.1	72.5	73.4	72.1	73.5	71.6	6821	77.9
1994	5888.7	950	71.4	72.3	71.3	72.0	70.8	71.5	6718	76.7
1995	4717.1	950	58.4	70.5	56.7	70.0	56.7	69.6	5902	67.4
1996	5372.2	950	66.3	70.0	64.4	69.4	64.4	69.0	6372	72.5
1997	6284.4	950	79.9	71.1	75.5	70.0	75.5	69.6	7060	80.6
1998	6022.0	950	74.0	71.3	72.4	70.2	72.4	69.9	6839	78.1
1999	3921.3	950	49.8	69.5	47.1	68.3	47.1	68.0	4630	52.9
2000	6708.4	950	83.8	70.6	80.3	69.2	80.4	68.9	7423	84.5
2001	6091.2	950	89.8	72.0	73.1	69.5	73.0	69.2	7884	89.8
2002	6337.1	950	78.5	72.5	76.1	69.9	76.1	69.7	6895	78.7
2003	6736.3	950	82.4	73.1	80.9	70.6	80.9	70.4	7248	82.7
2004	6537.6	950	88.5	74.0	78.3	71.1	78.3	70.9	7247	82.5
2005	6511.9	950	85.1	74.6	84.1	71.8	78.2	71.3	7498	85.6
2006	6621.8	950	85.2	75.2	84.8	72.5	79.6	71.7	7186	82.0
2007	7027.8	950	87.1	75.8	86.2	73.2	84.4	72.4	7645	87.3
2008	6031.6	950	82.2	76.1	79.6	73.5	72.3	72.4	7265	82.7

2009	6121.3	950	87.3	76.6	86.7	74.1	73.6	72.4	7111	81.2
2010	6388.9	950	83.8	76.9	81.3	74.4	76.8	72.6	7086	80.9
2011	6353.8	950	77.6	77.0	76.6	74.5	76.3	72.8	6892	78.7
2012	6403.1	950	77.4	77.0	77.1	74.6	76.7	72.9	6941	79.0
2013	6405.0	950	84.2	77.3	82.4	74.9	77.0	73.1	7580	86.5
2014	6582.8	950	82.6	77.5	80.9	75.2	79.1	73.3	7375	84.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					114	
C. Inspection, maintenance or repair combined with refuelling	1385			1458		
D. Inspection, maintenance or repair without refuelling				111		
E. Testing of plant systems or components				13	0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						63
L. Human factor related					23	
Subtotal	1385	0	0	1582	137	63
Total	1385			1782		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		4
14. Safety Systems		1
15. Reactor Cooling Systems		7
16. Steam generation systems		13
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		4
35. All other I&C Systems		0
41. Main Generator Systems		55
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		0
Total	0	109

# UA-126 ZAPOROZHYE-5

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 5921.0 GW(e)·h  
**Energy Availability Factor:** 95.6%  
**Load Factor:** 71.1%  
**Operating Factor:** 86.8%  
**Energy Unavailability Factor:** 4.4%  
**Total Off-line Time:** 1159 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	498.4	507.6	531.1	566.2	92.8	156.6	475.0	598.9	586.1	688.5	695.3	524.4	5921.0
<b>EAF (%)</b>	86.9	98.9	98.2	97.4	99.2	98.5	84.4	94.2	95.9	97.3	98.3	98.3	95.6
<b>UCF (%)</b>	87.2	99.3	99.1	98.9	99.7	99.4	87.2	98.2	98.5	98.8	99.0	99.2	97.0
<b>LF (%)</b>	70.5	79.5	75.2	82.8	13.1	22.9	67.2	84.7	85.7	97.3	101.7	74.2	71.1
<b>OF (%)</b>	88.7	100.0	100.0	100.0	24.5	39.3	89.8	100.0	100.0	100.0	100.0	100.0	86.8
<b>EUf (%)</b>	13.1	1.1	1.8	2.6	0.8	1.5	15.6	5.8	4.1	2.7	1.7	1.7	4.4
<b>PUf (%)</b>	12.8	0.7	0.9	1.1	0.3	0.6	12.8	1.8	1.5	1.2	1.0	0.8	3.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.3	0.4	0.9	1.5	0.5	1.0	2.9	4.0	2.6	1.5	0.7	0.9	1.4

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION-211 GW(E)H; RESERVE UNIT SHUTDOWNS AND REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST -1 843 GW(E)H

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1985 **Lifetime Generation:** 151326.0 GW(e)·h  
**Date of First Criticality:** 20 Jul 1989 **Cumulative Energy Availability Factor:** 76.0%  
**Date of Grid Connection:** 14 Aug 1989 **Cumulative Load Factor:** 74.6%  
**Date of Commercial Operation:** 27 Oct 1989 **Cumulative Unit Capability Factor:** 77.7%  
**Cumulative Energy Unavailability Factor:** 24.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	1670.0	950	83.1	83.1	83.1	83.1	79.6	79.6	1957	88.6
1990	4678.7	950	57.9	63.0	56.6	62.0	56.2	60.9	6002	68.5
1991	6554.9	950	79.5	70.3	78.4	69.3	78.8	68.8	7319	83.6
1992	6898.8	1000	80.1	73.4	79.2	72.4	78.5	71.9	7032	80.1
1993	5661.8	950	68.9	72.4	68.3	71.5	68.0	71.0	6735	76.9
1994	4858.9	950	59.1	69.9	59.1	69.1	58.4	68.7	6779	77.4
1995	5391.9	950	66.0	69.3	64.7	68.4	64.8	68.0	6506	74.3
1996	6126.0	950	74.1	69.9	73.4	69.1	73.4	68.8	6799	77.4
1997	6381.5	950	76.2	70.7	75.8	69.9	76.7	69.7	6705	76.5
1998	5856.2	950	70.7	70.7	70.1	69.9	70.4	69.8	6249	71.3
1999	5070.2	950	63.0	70.0	60.6	69.0	60.9	68.9	5525	63.1
2000	6286.6	950	77.9	70.7	74.9	69.6	75.3	69.5	6928	78.9
2001	5890.8	950	76.2	71.1	70.7	69.6	70.6	69.6	6751	76.9
2002	6222.5	950	80.8	71.8	74.5	70.0	74.8	70.0	6983	79.7
2003	6585.5	950	80.2	72.4	79.0	70.6	79.1	70.6	7107	81.1
2004	6826.7	950	85.6	73.3	81.6	71.4	81.8	71.4	7551	86.0
2005	6278.9	950	81.5	73.8	80.8	71.9	75.4	71.6	6975	79.6
2006	6713.6	950	83.7	74.4	83.3	72.6	80.7	72.1	7297	83.3
2007	6936.5	950	84.3	74.9	84.3	73.2	83.4	72.7	7408	84.6
2008	6935.9	950	87.6	75.6	86.9	73.9	83.1	73.3	7708	87.8
2009	6700.8	950	84.9	76.0	83.0	74.4	80.5	73.6	7445	85.0

2010	6507.6	950	80.4	76.2	78.3	74.6	78.2	73.8	7081	80.8
2011	6280.4	950	77.7	76.3	76.0	74.6	75.5	73.9	6861	78.3
2012	7022.3	950	85.0	76.7	82.9	75.0	84.2	74.4	7545	85.9
2013	6903.1	950	83.0	76.9	80.7	75.2	82.9	74.7	7381	84.3
2014	5921.0	950	97.0	77.7	95.6	76.0	71.1	74.6	7601	86.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					70	
C. Inspection, maintenance or repair combined with refuelling				1366		
D. Inspection, maintenance or repair without refuelling	160			180		
E. Testing of plant systems or components				18		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)			999			16
L. Human factor related					6	
Z. Other					1	
Subtotal	160	0	999	1564	77	16
Total		1159			1657	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		5
14. Safety Systems		1
15. Reactor Cooling Systems		6
16. Steam generation systems		32
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		6
32. Feedwater and Main Steam System		5
41. Main Generator Systems		5
42. Electrical Power Supply Systems		4
Total	0	65

# UA-127 ZAPOROZHYE-6

**Operator:** NNEGC (State Enterprise "National Nuclear Energy Generating Company 'Energoatom'")

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 950.0 MW(e)  
**Design Net Capacity:** 950.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6704.1 GW(e)·h  
**Energy Availability Factor:** 80.3%  
**Load Factor:** 80.6%  
**Operating Factor:** 82.4%  
**Energy Unavailability Factor:** 19.7%  
**Total Off-line Time:** 1543 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	725.7	596.3	604.7	638.4	707.3	530.6	0.0	69.5	685.9	730.1	712.5	703.0	6704.1
<b>EAF (%)</b>	99.0	98.8	98.5	96.9	96.1	75.9	0.0	13.2	96.3	97.7	98.6	96.2	80.3
<b>UCF (%)</b>	99.7	99.3	99.3	98.2	98.7	78.3	0.0	13.6	98.7	99.1	99.4	96.7	81.5
<b>LF (%)</b>	102.7	93.4	85.7	93.3	100.1	77.6	0.0	9.8	100.3	103.2	104.2	99.5	80.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	80.0	0.0	14.2	100.0	100.0	100.0	97.7	82.4
<b>EUf (%)</b>	1.0	1.2	1.5	3.1	3.9	24.1	100.0	86.8	3.7	2.3	1.4	3.8	19.7
<b>PUf (%)</b>	0.3	0.7	0.7	0.9	1.3	21.7	100.0	86.5	1.3	0.9	0.6	0.5	18.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.3
<b>XUF (%)</b>	0.7	0.5	0.8	1.3	2.6	2.4	0.0	0.4	2.4	1.4	0.8	0.5	1.1

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION-28 GW(E)H; REDUCED POWER UPON THE GRID DISPATCHER'S REQUEST - 188 GW(E)H

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1986 **Lifetime Generation:** 120387.0 GW(e)·h  
**Date of First Criticality:** 06 Oct 1995 **Cumulative Energy Availability Factor:** 79.6%  
**Date of Grid Connection:** 19 Oct 1995 **Cumulative Load Factor:** 78.6%  
**Date of Commercial Operation:** 17 Sep 1996 **Cumulative Unit Capability Factor:** 81.4%  
**Cumulative Energy Unavailability Factor:** 20.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1996	2359.7	950	86.4	86.4	84.8	84.8	84.8	84.8	2540	86.7
1997	6332.7	950	75.5	78.2	75.2	77.6	76.1	78.3	6640	75.8
1998	6132.2	950	76.2	77.4	73.4	75.8	73.7	76.3	6766	77.2
1999	6165.4	950	78.4	77.7	74.1	75.3	74.1	75.6	6934	79.2
2000	5844.2	950	70.1	75.9	69.3	73.9	70.0	74.3	6191	70.5
2001	6336.2	950	80.1	76.7	75.2	74.2	75.9	74.6	7118	81.0
2002	6790.6	950	83.4	77.8	81.0	75.2	81.6	75.7	7393	84.4
2003	7006.4	950	86.3	78.9	83.5	76.3	84.2	76.9	7590	86.6
2004	6867.8	950	87.4	79.9	81.7	77.0	82.3	77.5	7715	87.8
2005	5850.7	950	84.5	80.4	83.5	77.7	70.3	76.8	6557	74.9
2006	6855.0	950	84.0	80.8	83.6	78.3	82.4	77.3	7317	83.5
2007	6756.3	950	83.4	81.0	83.3	78.7	81.2	77.7	7275	83.0
2008	6355.3	950	83.9	81.2	83.7	79.1	76.2	77.5	6888	78.4
2009	6964.6	950	83.0	81.4	82.9	79.4	83.7	78.0	7285	83.2
2010	6583.5	950	81.8	81.4	80.3	79.5	79.1	78.1	7181	82.0
2011	6820.9	950	82.1	81.4	81.9	79.6	82.0	78.3	7254	82.8
2012	6911.0	950	84.5	81.6	82.7	79.8	82.8	78.6	7496	85.3
2013	6357.0	950	77.2	81.4	76.0	79.6	76.4	78.5	6819	77.8
2014	6704.1	950	81.5	81.4	80.3	79.6	80.6	78.6	7217	82.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1995 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		16			26	
C. Inspection, maintenance or repair combined with refuelling	1525			1289		
D. Inspection, maintenance or repair without refuelling				73		
E. Testing of plant systems or components				22		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						68
Subtotal	1525	16	0	1384	26	68
Total		1541			1478	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1995 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
15. Reactor Cooling Systems		2
16. Steam generation systems		9
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		0
35. All other I&C Systems		0
41. Main Generator Systems		1
42. Electrical Power Supply Systems	16	1
XX. Miscellaneous Systems		1
Total	16	22

# GB-18A DUNGENESS B-1

Operator: EDF UK (EDF Energy)

Contractor: APC (ATOMIC POWER CONSTRUCTION LTD.)

## 1. Station Details

Type: GCR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 520.0 MW(e)  
 Design Net Capacity: 607.0 MW(e)  
 Design Discharge Burnup: —  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 1641.9 GW(e)-h  
 Energy Availability Factor: 37.4%  
 Load Factor: 36.0%  
 Operating Factor: 50.3%  
 Energy Unavailability Factor: 62.6%  
 Total Off-line Time: 4351 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)-h	227.8	288.1	251.5	-5.3	-10.2	-9.6	107.8	134.6	264.2	163.8	147.5	81.5	1641.9
EAF (%)	59.3	81.8	65.1	0.0	0.0	0.0	28.6	36.8	70.9	44.1	41.9	23.5	37.4
UCF (%)	59.4	81.9	65.1	0.0	0.0	0.0	28.6	36.8	70.9	44.1	41.9	23.5	37.4
LF (%)	58.9	82.4	65.1	-1.4	-2.6	-2.6	27.9	34.8	70.6	42.3	39.4	21.1	36.0
OF (%)	75.8	88.8	67.0	0.0	0.0	0.0	81.7	64.2	93.1	54.2	57.5	23.7	50.3
EUUF (%)	40.7	18.2	34.9	100.0	100.0	100.0	71.4	63.2	29.1	55.9	58.1	76.5	62.6
PUF (%)	39.2	0.0	34.9	100.0	100.0	47.0	0.2	0.0	0.0	44.2	0.0	0.0	30.6
UCLF (%)	1.4	18.2	0.0	0.0	0.0	53.0	71.2	63.2	29.2	11.7	58.2	76.5	31.9
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

CARRIED OUT A STATUTORY OUTAGE

## 5. Historical Summary

Date of Construction Start: 01 Oct 1965      Lifetime Generation: 81534.7 GW(e)-h  
 Date of First Criticality: 23 Dec 1982      Cumulative Energy Availability Factor: 42.9%  
 Date of Grid Connection: 03 Apr 1983      Cumulative Load Factor: 41.9%  
 Date of Commercial Operation: 01 Apr 1985      Cumulative Unit Capability Factor: 44.4%  
    Cumulative Energy Unavailability Factor: 57.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	1826.2	450	64.8	64.8	62.8	62.8	61.9	61.9	4443	67.8
1986	1172.6	450	33.7	47.0	29.1	43.5	29.8	43.6	4447	50.9
1987	210.3	450	13.2	34.6	6.5	29.9	5.2	29.5	1179	13.2
1988	1233.9	450	45.5	37.5	33.3	30.8	31.4	30.0	3857	44.2
1989	647.2	412	43.8	38.7	24.8	29.6	18.0	27.6	2650	30.3
1990	758.0	360	26.3	36.9	26.3	29.1	24.1	27.1	5093	58.3
1991	2656.2	410	74.5	42.3	74.5	35.6	74.0	33.8	7329	83.9
1992	1052.3	441	27.5	40.3	27.4	34.5	26.7	32.8	2670	30.0
1993	3493.2	516	77.5	45.3	77.1	40.2	77.5	38.8	7138	81.7
1994	2385.7	555	51.5	46.0	49.2	41.4	49.2	40.1	4676	53.5
1995	873.7	555	18.2	42.9	18.2	38.8	17.9	37.6	1587	18.1
1996	2517.0	555	51.6	43.8	51.6	40.1	51.6	39.1	5311	60.5
1997	2078.2	555	42.9	43.7	42.9	40.3	42.6	39.4	4549	51.8
1998	2198.3	555	47.4	44.0	47.0	40.9	45.1	39.9	5716	65.1
1999	1584.2	555	33.0	43.2	33.0	40.3	32.5	39.3	4752	54.1
2000	409.6	555	8.4	40.7	8.4	38.0	8.4	37.1	1201	13.7
2001	3049.1	555	62.2	42.1	61.9	39.6	62.5	38.8	7108	80.9
2002	2167.6	555	45.6	42.3	45.5	40.0	44.6	39.1	5043	57.6
2003	2482.9	555	54.6	43.1	51.9	40.7	51.1	39.8	5212	59.5
2004	3082.5	555	63.8	44.2	63.8	42.0	63.2	41.2	6305	71.8
2005	2955.1	555	61.7	45.1	61.6	43.0	60.8	42.2	6039	68.9
2006	2453.8	555	51.7	45.5	51.6	43.4	51.2	42.6	5246	59.9
2007	2981.3	545	63.3	46.3	63.3	44.4	62.4	43.6	6447	73.6

2008	1999.9	520	43.7	46.2	43.7	44.3	43.3	43.6	4467	50.9
2009	1627.0	520	36.0	45.8	36.0	44.0	35.7	43.2	3527	40.3
2010	948.9	520	20.8	44.8	20.8	43.1	20.8	42.3	3233	36.9
2011	655.6	520	16.1	43.7	16.1	42.0	14.4	41.3	2517	28.7
2012	1979.1	520	44.4	43.7	44.4	42.1	43.3	41.4	4632	52.7
2013	2891.1	520	69.5	44.6	69.5	43.1	63.5	42.1	6215	70.9
2014	1641.9	520	37.4	44.4	37.4	42.9	36.0	41.9	4409	50.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1802			1172	
B. Refuelling without a maintenance	501			254	80	
C. Inspection, maintenance or repair combined with refuelling	2047			581	164	
D. Inspection, maintenance or repair without refuelling				1047	60	
E. Testing of plant systems or components					9	
H. Nuclear regulatory requirements					4	
J. Grid limitation, failure or grid unavailability						22
L. Human factor related					35	
P. Fire					5	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					52	
Z. Other				77	76	3
Subtotal	2548	1802	0	1959	1657	25
Total		4350			3641	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		187
12. Reactor I&C Systems		48
13. Reactor Auxiliary Systems		13
14. Safety Systems		1
15. Reactor Cooling Systems	568	108
16. Steam generation systems		47
21. Fuel Handling and Storage Facilities	469	111
31. Turbine and auxiliaries		52
32. Feedwater and Main Steam System	410	468
33. Circulating Water System		18
41. Main Generator Systems	195	100
42. Electrical Power Supply Systems	118	14
XX. Miscellaneous Systems	42	0
Total	1802	1167



**GB-18B DUNGENESS B-2**

Operator: EDF UK (EDF Energy)

Contractor: APC (ATOMIC POWER CONSTRUCTION LTD.)

**1. Station Details**

Type: GCR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 520.0 MW(e)  
 Design Net Capacity: 607.0 MW(e)  
 Design Discharge Burnup: —  
 Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 2745.1 GW(e)-h  
 Energy Availability Factor: 62.8%  
 Load Factor: 60.3%  
 Operating Factor: 70.2%  
 Energy Unavailability Factor: 37.2%  
 Total Off-line Time: 2607 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)-h	369.0	207.3	382.4	171.8	-10.2	347.5	394.8	217.7	160.3	63.3	76.1	365.1	2745.1
EAF (%)	95.4	59.3	97.0	58.4	15.0	91.0	100.0	57.5	44.3	18.9	23.0	92.5	62.8
UCF (%)	95.4	59.3	97.0	58.4	15.0	91.0	100.0	57.5	44.3	18.9	23.0	92.5	62.8
LF (%)	95.4	59.3	99.0	45.9	-2.6	92.8	102.1	56.3	42.8	16.3	20.3	94.4	60.3
OF (%)	99.2	66.4	99.2	55.8	1.5	98.8	100.0	72.0	62.8	36.5	50.0	100.0	70.2
EUf (%)	4.6	40.7	3.0	41.6	85.0	9.0	0.0	42.5	55.7	81.1	77.0	7.5	37.2
PUf (%)	1.3	40.6	2.8	27.7	40.6	0.0	0.0	0.0	37.3	8.1	0.0	0.0	13.0
UCLF (%)	3.3	0.1	0.2	13.9	44.4	9.0	0.0	42.4	18.4	72.9	77.0	7.5	24.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Oct 1965      Lifetime Generation: 86916.9 GW(e)-h  
 Date of First Criticality: 04 Dec 1985      Cumulative Energy Availability Factor: 49.6%  
 Date of Grid Connection: 29 Dec 1985      Cumulative Load Factor: 49.4%  
 Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 49.8%  
    Cumulative Energy Unavailability Factor: 50.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	0.0	412	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
1990	726.0	360	23.1	12.6	23.1	12.6	23.1	12.6	4060	46.5
1991	1467.2	410	44.8	24.9	44.8	24.9	40.9	23.4	4295	49.2
1992	2360.4	441	62.0	35.9	61.9	35.9	59.9	34.2	6525	73.3
1993	2306.7	517	50.2	39.5	50.0	39.4	51.0	38.5	4672	53.5
1994	2568.3	555	57.1	43.3	57.0	43.2	53.0	41.6	5075	58.1
1995	773.8	555	16.1	38.5	16.1	38.4	15.9	37.0	1358	15.5
1996	3615.0	555	74.2	43.8	74.1	43.8	74.2	42.6	6882	78.3
1997	3327.3	555	68.5	47.1	68.3	47.0	68.3	46.0	6975	79.4
1998	1897.8	555	39.2	46.1	39.2	46.1	38.9	45.1	4390	50.0
1999	2123.3	555	30.6	44.5	30.6	44.5	43.6	45.0	5504	62.7
2000	1814.3	555	37.2	43.9	37.2	43.8	37.2	44.2	3767	42.9
2001	3007.4	555	62.1	45.4	61.1	45.3	61.7	45.7	6393	72.8
2002	2483.3	555	51.8	45.9	51.8	45.8	51.1	46.2	5135	58.6
2003	3747.3	555	78.3	48.3	76.0	48.0	77.1	48.4	7275	83.0
2004	3514.4	555	72.6	50.0	72.6	49.7	72.1	50.0	7138	81.3
2005	2739.7	555	57.7	50.4	57.7	50.2	56.4	50.4	5612	64.1
2006	2695.7	555	57.9	50.9	56.9	50.6	56.2	50.8	5712	65.2
2007	2875.7	545	60.9	51.4	60.9	51.2	60.2	51.3	6301	71.9
2008	1568.9	520	34.4	50.6	34.4	50.3	33.9	50.4	3356	38.2
2009	2385.7	520	52.6	50.7	52.6	50.4	52.4	50.5	5597	63.9
2010	2766.0	520	60.2	51.1	60.2	50.9	60.7	51.0	6173	70.5
2011	691.1	520	16.9	49.6	16.9	49.4	15.2	49.4	2754	31.4
2012	2099.7	520	46.2	49.5	46.2	49.2	46.0	49.3	4420	50.3

2013	1869.0	520	44.9	49.3	44.9	49.1	41.0	48.9	4308	49.2
2014	2745.1	520	62.8	49.8	62.8	49.6	60.3	49.4	6153	70.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1220			755	
B. Refuelling without a maintenance	529			265	124	
C. Inspection, maintenance or repair combined with refuelling	507	155		766	108	
D. Inspection, maintenance or repair without refuelling				989		
E. Testing of plant systems or components					8	
H. Nuclear regulatory requirements					4	
J. Grid limitation, failure or grid unavailability			195			14
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						4
L. Human factor related					4	
P. Fire					75	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					40	
Z. Other				104	75	8
Subtotal	1036	1375	195	2124	1193	26
Total		2606			3343	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems	140	53
13. Reactor Auxiliary Systems		1
14. Safety Systems	137	
15. Reactor Cooling Systems		24
16. Steam generation systems		57
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		201
31. Turbine and auxiliaries		37
32. Feedwater and Main Steam System	324	216
33. Circulating Water System	66	67
41. Main Generator Systems	480	22
42. Electrical Power Supply Systems	70	23
XX. Miscellaneous Systems		38
Total	1217	747

## GB-19A HARTLEPOOL A-1

Operator: EDF UK (EDF Energy)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

### 1. Station Details

Type: GCR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 595.0 MW(e)  
 Design Net Capacity: 625.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 3158.0 GW(e)·h  
 Energy Availability Factor: 60.9%  
 Load Factor: 60.6%  
 Operating Factor: 66.0%  
 Energy Unavailability Factor: 39.1%  
 Total Off-line Time: 2978 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	442.4	366.2	438.0	304.4	282.6	424.3	435.5	155.1	0.0	-2.4	-8.9	320.9	3158.0
EAF (%)	99.8	91.6	99.1	71.3	64.8	99.1	98.4	35.3	0.0	0.0	0.0	72.5	60.9
UCF (%)	99.8	91.6	99.1	71.3	64.8	99.1	98.4	35.3	0.0	0.0	0.0	72.5	60.9
LF (%)	99.9	91.6	99.1	71.1	63.8	99.1	98.4	35.0	0.0	-0.5	-2.1	72.5	60.6
OF (%)	100.0	100.0	100.0	84.6	72.2	100.0	100.0	36.7	0.0	0.0	0.0	99.5	66.0
EUAF (%)	0.2	8.4	0.9	28.7	35.2	0.9	1.6	64.7	100.0	100.0	100.0	27.5	39.1
PUF (%)	0.0	0.0	0.0	25.1	24.9	0.9	1.6	52.6	100.0	90.6	0.0	16.7	26.2
UCLF (%)	0.2	8.4	0.9	3.6	10.4	0.0	0.0	12.0	0.0	9.4	100.0	10.8	12.9
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

SHUTDOWN FOR A STATUTORY OUTAGE AND BOILER SPINE INSPECTIONS FOLLOWING DISCOVERY OF A BOILER SPINE CRACK ON HEYSHAM-A1. NO CRACK FOUND, BUT RETURNED TO SERVICE AT REDUCE LOAD TO MANAGE BOILER TEMPERATURES.

### 5. Historical Summary

Date of Construction Start: 01 Oct 1968      Lifetime Generation: 96428.0 GW(e)·h  
 Date of First Criticality: 24 Jun 1983      Cumulative Energy Availability Factor: 69.4%  
 Date of Grid Connection: 01 Aug 1983      Cumulative Load Factor: 67.6%  
 Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 69.5%  
    Cumulative Energy Unavailability Factor: 30.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	1315.7	539	72.8	72.8	72.8	72.8	39.1	39.1	2983	45.2
1990	1698.7	487	40.1	54.5	40.1	54.5	39.9	39.5	3486	39.9
1991	2953.4	625	75.0	63.1	75.0	63.1	54.1	45.6	6791	77.7
1992	2910.4	510	63.6	63.2	63.5	63.2	64.1	50.4	6156	69.1
1993	4449.6	582	87.4	68.7	87.1	68.5	87.4	58.7	7802	89.3
1994	4296.6	605	81.7	71.1	81.4	71.0	81.3	62.9	7716	88.3
1995	3584.2	605	67.7	70.6	67.7	70.4	67.4	63.7	5937	67.6
1996	4518.0	605	85.7	72.7	85.6	72.5	85.0	66.6	7691	87.6
1997	4441.7	605	83.9	74.0	83.6	73.9	83.6	68.7	7644	87.0
1998	3892.3	605	73.5	74.0	73.5	73.8	73.2	69.1	7108	80.9
1999	5000.1	605	94.4	75.9	94.4	75.8	94.1	71.6	8369	95.3
2000	4757.3	605	89.5	77.1	88.6	77.0	89.5	73.2	8153	92.8
2001	4291.2	605	81.0	77.5	80.9	77.3	80.7	73.8	7301	83.1
2002	4627.8	605	87.5	78.2	87.5	78.1	87.3	74.8	7965	90.9
2003	4583.3	605	86.6	78.8	86.6	78.7	86.5	75.6	7856	89.7
2004	1942.7	605	36.9	76.1	36.9	75.9	36.6	73.1	3385	38.5
2005	2322.9	605	43.9	74.1	43.9	74.0	43.8	71.3	4829	55.1
2006	2378.9	605	45.9	72.5	45.9	72.4	45.5	69.8	4291	49.0
2007	3295.8	595	63.1	72.0	63.1	71.9	63.2	69.4	5680	64.8
2008	0.0	595	0.0	68.3	0.0	68.2	0.0	65.9	0	0.0
2009	3946.0	595	76.0	68.7	76.0	68.6	75.7	66.4	6986	79.7

2010	4407.4	595	84.2	69.4	84.2	69.3	84.6	67.2	7547	86.2
2011	3102.6	595	59.9	69.0	59.9	68.9	59.5	66.9	5514	62.9
2012	4301.9	595	82.5	69.5	82.5	69.4	82.3	67.5	7613	86.7
2013	3992.4	595	76.9	69.8	76.9	69.8	76.6	67.9	7557	86.3
2014	3158.0	595	60.9	69.5	60.9	69.4	60.6	67.6	5782	66.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		905			985	
B. Refuelling without a maintenance	293			113	11	
C. Inspection, maintenance or repair combined with refuelling	1779			459	9	
D. Inspection, maintenance or repair without refuelling				856		
E. Testing of plant systems or components					14	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				39		
H. Nuclear regulatory requirements					104	
J. Grid limitation, failure or grid unavailability						5
L. Human factor related					6	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					5	
Z. Other				24	60	
Subtotal	2072	905	0	1491	1194	5
Total		2977			2690	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		373
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		37
15. Reactor Cooling Systems		13
16. Steam generation systems	880	180
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities	24	21
31. Turbine and auxiliaries		48
32. Feedwater and Main Steam System		56
33. Circulating Water System		68
41. Main Generator Systems		133
42. Electrical Power Supply Systems		33
Total	904	981

## GB-19B HARTLEPOOL A-2

Operator: EDF UK (EDF Energy)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

### 1. Station Details

Type: GCR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 585.0 MW(e)  
 Design Net Capacity: 600.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 2662.3 GW(e)·h  
 Energy Availability Factor: 52.9%  
 Load Factor: 52.0%  
 Operating Factor: 60.4%  
 Energy Unavailability Factor: 47.1%  
 Total Off-line Time: 3470 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	361.2	243.7	93.2	413.8	436.3	400.2	204.4	131.1	-8.6	-4.9	49.3	342.6	2662.3
EAF (%)	83.0	62.6	23.9	97.3	100.0	95.0	48.3	32.1	0.0	0.0	14.7	78.7	52.9
UCF (%)	83.0	62.6	23.9	97.3	100.0	95.0	48.3	32.1	0.0	0.0	14.7	78.7	52.9
LF (%)	83.0	62.0	21.4	98.2	100.2	95.0	47.0	30.1	-2.0	-1.1	11.7	78.7	52.0
OF (%)	100.0	76.8	29.9	100.0	100.0	100.0	60.2	33.5	0.0	0.0	25.4	100.0	60.4
EUf (%)	17.0	37.4	76.1	2.7	0.0	5.0	51.7	67.9	100.0	100.0	85.3	21.3	47.1
PUf (%)	0.0	21.4	20.3	0.0	0.0	0.5	40.9	1.8	1.1	0.1	2.5	18.2	8.9
UCLF (%)	17.0	16.0	55.8	2.7	0.0	4.5	10.9	66.2	98.9	99.9	82.8	3.1	38.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

SHUTDOWN FOR BOILER SPINE INSPECTIONS FOLLOWING DISCOVERY OF A BOILER SPINE CRACK ON HEYSHAM-A1. NO CRACK FOUND, BUT RETURNED TO SERVICE AT REDUCE LOAD TO MANAGE BOILER TEMPERATURES.

### 5. Historical Summary

Date of Construction Start: 01 Oct 1968      Lifetime Generation: 90782.5 GW(e)·h  
 Date of First Criticality: 09 Sep 1984      Cumulative Energy Availability Factor: 70.8%  
 Date of Grid Connection: 31 Oct 1984      Cumulative Load Factor: 69.4%  
 Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 71.0%  
    Cumulative Energy Unavailability Factor: 29.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	2234.8	421	100.0	100.0	100.0	100.0	80.6	80.6	4689	71.0
1990	3238.4	487	74.1	84.3	74.1	84.3	76.0	77.8	6796	77.8
1991	1855.9	625	55.1	71.6	55.1	71.6	34.0	58.7	3755	43.0
1992	4316.8	571	87.3	76.1	87.0	76.0	84.9	66.3	7923	89.0
1993	4264.6	582	84.9	78.1	83.8	77.8	83.8	70.2	7682	87.9
1994	3703.9	605	70.2	76.6	69.9	76.3	70.1	70.2	6612	75.7
1995	3750.7	605	70.9	75.7	70.9	75.4	70.6	70.2	6149	70.0
1996	4370.3	605	82.2	76.6	82.1	76.3	82.2	71.9	8131	92.6
1997	4127.9	605	77.9	76.8	77.2	76.4	77.7	72.6	6954	79.2
1998	4555.1	605	86.0	77.7	85.6	77.4	85.7	74.0	7973	90.8
1999	4472.5	605	84.4	78.4	83.6	78.0	84.2	75.0	7808	88.9
2000	4265.9	605	80.3	78.6	80.3	78.2	80.3	75.5	7463	85.0
2001	4635.9	605	87.5	79.3	87.5	79.0	87.2	76.4	8092	92.1
2002	4910.3	605	92.7	80.3	92.7	80.0	92.7	77.6	8383	95.7
2003	3488.4	605	66.4	79.3	66.4	79.1	65.8	76.8	6258	71.4
2004	3380.6	605	64.0	78.3	64.0	78.1	63.6	76.0	6016	68.5
2005	3651.6	605	69.2	77.8	69.2	77.5	68.9	75.5	6428	73.4
2006	2481.1	605	47.8	76.1	47.8	75.8	47.4	73.9	4455	50.9
2007	3593.6	595	69.1	75.7	69.1	75.5	68.9	73.6	6514	74.4
2008	0.0	595	0.0	71.8	0.0	71.6	0.0	69.9	0	0.0
2009	2882.1	595	56.0	71.0	56.0	70.9	55.3	69.2	5360	61.2

2010	3738.1	595	71.7	71.1	71.7	70.9	71.7	69.3	6674	76.2
2011	4251.6	595	81.9	71.5	81.9	71.4	81.6	69.8	7533	86.0
2012	4520.2	585	87.7	72.2	87.7	72.1	88.0	70.6	7880	89.7
2013	3014.5	585	59.2	71.7	59.2	71.5	58.8	70.1	5517	63.0
2014	2662.3	585	52.9	71.0	52.9	70.8	52.0	69.4	5290	60.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2509			914	
B. Refuelling without a maintenance	587	169		74	1	
C. Inspection, maintenance or repair combined with refuelling				601	27	
D. Inspection, maintenance or repair without refuelling				547		
E. Testing of plant systems or components					4	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				36		
H. Nuclear regulatory requirements					42	
L. Human factor related					5	
P. Fire		204			11	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					0	
Z. Other				106	6	
Subtotal	587	2882	0	1364	1010	0
Total		3469			2374	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		414
12. Reactor I&C Systems	12	14
13. Reactor Auxiliary Systems		8
15. Reactor Cooling Systems		60
16. Steam generation systems	2497	41
21. Fuel Handling and Storage Facilities		17
31. Turbine and auxiliaries		21
32. Feedwater and Main Steam System		134
33. Circulating Water System		67
41. Main Generator Systems		111
42. Electrical Power Supply Systems		23
Total	2509	910

## GB-20A HEYSHAM A-1

Operator: EDF UK (EDF Energy)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

### 1. Station Details

Type: GCR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 580.0 MW(e)  
 Design Net Capacity: 611.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 1073.9 GW(e)·h  
 Energy Availability Factor: 22.2%  
 Load Factor: 21.1%  
 Operating Factor: 32.4%  
 Energy Unavailability Factor: 77.8%  
 Total Off-line Time: 5919 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	1.4	234.2	180.9	296.6	301.8	92.9	-3.6	-3.8	-5.4	-8.0	-4.4	-8.7	1073.9
EAF (%)	2.6	60.6	42.8	71.0	69.9	23.0	0.0	0.0	0.0	0.0	0.0	0.0	22.2
UCF (%)	2.6	60.6	42.8	71.0	70.0	23.0	0.0	0.0	0.0	0.0	0.0	0.0	22.2
LF (%)	0.3	60.1	42.0	71.0	69.9	22.2	-0.8	-0.9	-1.3	-1.8	-1.1	-2.0	21.1
OF (%)	8.5	88.2	64.7	100.0	100.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	32.4
EUAF (%)	97.4	39.4	57.2	29.0	30.1	77.0	100.0	100.0	100.0	100.0	100.0	100.0	77.8
PUF (%)	0.0	21.2	1.7	0.0	0.0	67.0	100.0	34.4	0.1	0.0	0.0	0.0	18.7
UCLF (%)	97.4	18.2	55.5	29.0	30.1	10.0	0.0	65.6	99.9	100.0	100.0	100.0	59.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

OPERATED ON 3 OUT OF 4 BOILER QUADRANTS AND AT REDUCED BOILER TEMPERATURE FOLLOWING DISCOVERY OF A BOILER SPINE CRACK.

### 5. Historical Summary

Date of Construction Start: 01 Dec 1970      Lifetime Generation: 91853.8 GW(e)·h  
 Date of First Criticality: 06 Apr 1983      Cumulative Energy Availability Factor: 68.4%  
 Date of Grid Connection: 09 Jul 1983      Cumulative Load Factor: 67.4%  
 Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 68.6%  
    Cumulative Energy Unavailability Factor: 31.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	2351.6	420	100.0	100.0	100.0	100.0	84.8	84.8	5448	82.5
1990	1786.7	487	43.4	65.7	43.4	65.7	42.0	58.9	4096	46.9
1991	3826.2	621	86.4	74.7	86.4	74.7	70.5	63.9	7279	83.3
1992	2764.2	550	55.8	69.4	55.6	69.3	56.4	61.8	5981	67.2
1993	3638.2	555	75.0	70.6	74.3	70.4	75.0	64.7	6643	76.0
1994	4563.4	575	90.5	74.3	90.4	74.1	90.8	69.5	8128	93.0
1995	2808.9	575	55.9	71.4	55.9	71.3	55.6	67.4	4794	54.6
1996	4056.8	575	80.3	72.6	80.2	72.5	80.3	69.1	7674	87.4
1997	4298.8	575	85.4	74.1	84.5	73.9	85.1	71.0	7757	88.3
1998	3766.1	575	74.8	74.2	73.8	73.9	74.6	71.4	6950	79.1
1999	4549.8	575	90.4	75.8	89.7	75.4	90.1	73.2	7990	91.0
2000	4587.9	575	90.8	77.1	90.4	76.7	90.8	74.7	8230	93.7
2001	4034.6	575	78.0	77.2	77.6	76.8	79.9	75.2	6959	79.2
2002	4445.5	575	88.4	78.0	87.9	77.6	88.3	76.1	7921	90.4
2003	3746.2	575	74.8	77.8	74.4	77.4	74.4	76.0	6783	77.4
2004	2638.1	575	52.8	76.2	52.5	75.8	52.2	74.5	4951	56.4
2005	4033.1	575	80.1	76.4	80.1	76.1	80.1	74.8	7458	85.1
2006	3839.1	575	75.5	76.3	75.5	76.0	75.2	74.8	7229	82.5
2007	2498.5	585	49.1	74.8	49.1	74.5	48.8	73.4	4892	55.8
2008	0.0	585	0.0	70.9	0.0	70.6	0.0	69.5	0	0.0
2009	3478.3	585	68.4	70.8	68.4	70.5	67.9	69.5	6363	72.6
2010	2826.7	585	55.1	70.1	55.1	69.8	55.2	68.8	5117	58.4

2011	4627.9	585	90.5	71.0	90.5	70.7	90.3	69.8	8225	93.9
2012	3749.0	585	73.4	71.1	73.4	70.8	73.0	69.9	7055	80.3
2013	2833.0	585	56.6	70.5	56.6	70.3	55.3	69.3	5384	61.5
2014	1073.9	580	22.2	68.6	22.2	68.4	21.1	67.4	2841	32.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1021			834	
B. Refuelling without a maintenance				72		
C. Inspection, maintenance or repair combined with refuelling	1477	3419		696	40	
D. Inspection, maintenance or repair without refuelling				546		
E. Testing of plant systems or components					84	
H. Nuclear regulatory requirements					60	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					47	
Z. Other				59	32	6
Subtotal	1477	4440	0	1373	1097	8
Total		5917			2478	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		374
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		27
15. Reactor Cooling Systems		44
16. Steam generation systems	281	91
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System	740	18
33. Circulating Water System		147
41. Main Generator Systems		78
42. Electrical Power Supply Systems		34
XX. Miscellaneous Systems		9
Total	1021	830



**GB-20B HEYSHAM A-2**

Operator: EDF UK (EDF Energy)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

**1. Station Details**

Type: GCR

Net Reference Unit Power (RUP) at the beginning of 2014: 575.0 MW(e)

Design Net Capacity: 611.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 2775.3 GW(e)·h

Energy Availability Factor: 55.7%

Load Factor: 55.1%

Operating Factor: 61.5%

Energy Unavailability Factor: 44.3%

Total Off-line Time: 3375 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	45.4	378.2	417.3	403.0	184.1	397.6	404.4	149.3	-1.9	-0.1	68.5	329.5	2775.3
EAF (%)	12.6	97.9	97.7	97.3	44.8	96.0	94.5	36.3	0.0	0.0	18.7	77.0	55.7
UCF (%)	12.6	97.9	97.7	97.3	44.8	96.0	94.5	36.3	0.0	0.0	18.7	77.0	55.7
LF (%)	10.6	97.9	97.7	97.3	43.0	96.0	94.5	34.9	-0.5	0.0	16.5	77.0	55.1
OF (%)	22.0	100.0	100.0	100.0	51.2	100.0	100.0	39.9	0.0	0.0	27.8	100.0	61.5
EUAF (%)	87.4	2.1	2.3	2.7	55.2	4.0	5.5	63.7	100.0	100.0	81.3	23.0	44.3
PUF (%)	52.3	1.0	1.9	2.6	39.1	3.8	5.5	4.3	3.9	3.1	6.0	23.0	12.4
UCLF (%)	35.1	1.1	0.4	0.1	16.1	0.2	0.0	59.5	96.1	96.9	75.3	0.0	31.9
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

SHUTDOWN FOR BOILER SPINE INSPECTIONS FOLLOWING DISCOVERY OF A BOILER SPINE CRACK ON HEYSHAM-A1. NO CRACK FOUND, BUT RETURNED TO SERVICE AT REDUCE LOAD TO MANAGE BOILER TEMPERATURES.

**5. Historical Summary**

Date of Construction Start: 01 Dec 1970      Lifetime Generation: 86282.0 GW(e)·h

Date of First Criticality: 03 Jun 1984      Cumulative Energy Availability Factor: 67.4%

Date of Grid Connection: 11 Oct 1984      Cumulative Load Factor: 66.5%

Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 68.0%

Cumulative Energy Unavailability Factor: 32.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	2505.6	470	100.0	100.0	100.0	100.0	90.4	90.4	5507	83.4
1990	3044.2	487	72.0	83.0	72.0	83.0	71.5	78.9	6690	76.6
1991	2647.7	622	65.0	75.2	64.6	75.0	48.7	65.8	5132	58.7
1992	3548.1	550	74.6	75.0	72.8	74.4	72.5	67.7	6951	78.1
1993	4336.5	555	88.5	77.9	88.1	77.4	89.4	72.4	7886	90.3
1994	3707.5	575	75.3	77.5	72.8	76.5	73.8	72.7	6652	76.1
1995	3367.5	575	66.9	75.8	66.9	75.0	66.7	71.7	5772	65.7
1996	3561.9	575	70.8	75.1	70.5	74.4	70.5	71.6	6836	77.8
1997	4443.3	575	88.2	76.7	86.9	75.9	88.0	73.5	8026	91.4
1998	4497.6	575	89.3	78.0	86.7	77.1	89.0	75.2	7999	91.1
1999	3712.7	575	73.8	77.6	71.7	76.5	73.5	75.0	6570	74.8
2000	4342.6	575	86.3	78.4	86.1	77.4	86.0	76.0	7946	90.5
2001	4495.0	575	90.8	79.4	89.3	78.3	89.0	77.0	8187	93.2
2002	3407.9	575	68.3	78.6	68.1	77.6	67.7	76.3	6313	72.1
2003	3647.0	575	72.5	78.1	72.5	77.2	72.4	76.1	6595	75.3
2004	1974.6	575	39.9	75.7	39.7	74.8	39.1	73.7	3805	43.3
2005	2112.6	575	43.7	73.7	43.7	72.9	41.9	71.7	3869	44.2
2006	3972.3	575	79.0	74.0	79.0	73.3	78.9	72.1	7735	88.3
2007	2981.6	575	59.4	73.2	59.4	72.5	59.2	71.4	6280	71.7
2008	0.0	575	0.0	69.4	0.0	68.8	0.0	67.7	0	0.0
2009	2865.5	575	57.2	68.8	57.2	68.2	56.9	67.2	6414	73.2

2010	2421.7	575	48.1	67.9	48.1	67.3	48.1	66.3	5862	66.9
2011	3942.2	575	78.5	68.4	78.5	67.8	78.3	66.9	8117	92.7
2012	2891.7	575	58.0	67.9	58.0	67.3	57.3	66.4	5565	63.4
2013	4022.8	575	81.3	68.5	81.3	67.9	79.9	67.0	7464	85.2
2014	2775.3	575	55.7	68.0	55.7	67.4	55.1	66.5	5385	61.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2495			651	
B. Refuelling without a maintenance	661	216		99	0	
C. Inspection, maintenance or repair combined with refuelling				624	22	
D. Inspection, maintenance or repair without refuelling				538	239	
E. Testing of plant systems or components				6	21	
H. Nuclear regulatory requirements					111	
J. Grid limitation, failure or grid unavailability						11
L. Human factor related					3	
P. Fire					4	
Z. Other				87	57	5
Subtotal	661	2711	0	1354	1108	16
Total	3372			2478		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		185
12. Reactor I&C Systems		15
13. Reactor Auxiliary Systems		0
14. Safety Systems		0
15. Reactor Cooling Systems		49
16. Steam generation systems	2432	9
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		87
32. Feedwater and Main Steam System	63	43
33. Circulating Water System		122
41. Main Generator Systems		46
42. Electrical Power Supply Systems		85
XX. Miscellaneous Systems		5
Total	2495	647

**GB-22A HEYSHAM B-1**

Operator: EDF UK (EDF Energy)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

**1. Station Details**

Type: GCR

Net Reference Unit Power (RUP) at the beginning of 2014: 610.0 MW(e)

Design Net Capacity: 615.0 MW(e)

Design Discharge Burnup: 27000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 5228.2 GW(e)·h

Energy Availability Factor: 96.2%

Load Factor: 97.8%

Operating Factor: 100.0%

Energy Unavailability Factor: 3.8%

Total Off-line Time: 0 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	465.6	420.8	415.3	423.0	443.9	445.2	457.3	430.4	421.9	443.1	437.6	424.1	5228.2
EAF (%)	100.0	100.0	90.1	94.5	95.9	100.0	100.0	93.6	94.8	95.6	97.6	92.9	96.2
UCF (%)	100.0	100.0	90.1	94.6	95.9	100.0	100.0	93.6	94.8	95.7	97.6	92.9	96.2
LF (%)	102.6	102.7	91.6	96.3	97.8	101.4	100.8	94.8	96.1	97.5	99.6	93.4	97.8
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.0	9.9	5.5	4.1	0.0	0.0	6.4	5.2	4.4	2.4	7.1	3.8
PUf (%)	0.0	0.0	8.8	5.5	4.1	0.0	0.0	6.4	5.2	4.4	2.4	5.9	3.6
UCLF (%)	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 107152.4 GW(e)·h

Date of First Criticality: 23 Jun 1988      Cumulative Energy Availability Factor: 78.4%

Date of Grid Connection: 12 Jul 1988      Cumulative Load Factor: 77.4%

Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 79.1%

   Cumulative Energy Unavailability Factor: 21.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	900.8	615	56.9	56.9	56.9	56.9	22.2	22.2	2319	35.1
1990	1487.0	615	27.7	40.3	27.7	40.3	27.7	25.3	3509	40.2
1991	1465.4	615	36.9	39.1	36.9	39.1	27.3	26.0	2786	31.9
1992	4096.0	615	80.2	50.2	74.8	48.7	74.8	39.2	7240	81.3
1993	4498.2	622	83.7	57.3	82.3	55.8	82.7	48.4	7376	84.4
1994	4181.1	625	79.1	61.1	75.6	59.3	76.6	53.3	7255	83.0
1995	5193.8	625	94.9	66.2	94.5	64.6	94.6	59.5	8286	94.3
1996	4707.4	625	85.7	68.7	85.0	67.2	85.7	62.9	7699	87.6
1997	4152.8	625	75.9	69.5	75.2	68.1	75.6	64.4	7105	80.9
1998	5019.4	625	91.7	71.8	90.5	70.4	91.4	67.2	8688	98.9
1999	4235.5	625	77.4	72.3	76.6	71.0	77.1	68.1	7212	82.1
2000	4415.3	625	80.4	73.0	79.9	71.8	80.4	69.2	7502	85.4
2001	5241.0	625	92.0	74.5	91.5	73.3	95.5	71.2	8534	97.2
2002	4414.0	625	80.8	75.0	80.8	73.9	80.6	71.9	7501	85.6
2003	5045.3	625	92.2	76.2	92.0	75.1	92.2	73.3	8444	96.4
2004	4115.7	625	75.4	76.1	75.3	75.1	75.0	73.4	7250	82.5
2005	4262.5	625	78.0	76.2	78.0	75.3	77.9	73.7	7317	83.5
2006	4604.0	625	85.2	76.7	85.2	75.9	85.1	74.3	8057	92.0
2007	4617.3	615	85.8	77.2	85.8	76.4	85.7	74.9	8006	91.4
2008	3879.3	615	72.1	76.9	72.1	76.2	71.8	74.8	7038	80.1
2009	4750.2	620	87.8	77.5	87.7	76.7	87.6	75.4	8497	97.0
2010	5000.0	620	94.4	78.2	92.8	77.5	92.1	76.1	8637	98.6
2011	3920.8	605	73.2	78.0	73.2	77.3	74.0	76.0	6772	77.3
2012	4158.3	610	77.2	78.0	77.2	77.3	77.6	76.1	7238	82.4

2013	4756.1	610	87.7	78.4	87.7	77.7	89.0	76.6	8071	92.1
2014	5228.2	610	96.2	79.1	96.2	78.4	97.8	77.4	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					306	
C. Inspection, maintenance or repair combined with refuelling				627	39	
D. Inspection, maintenance or repair without refuelling				146		
E. Testing of plant systems or components				1	5	
J. Grid limitation, failure or grid unavailability						35
L. Human factor related					29	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				114		
Z. Other					0	12
Subtotal	0	0	0	888	379	47
Total	0			1314		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		3
15. Reactor Cooling Systems		5
16. Steam generation systems		27
21. Fuel Handling and Storage Facilities		5
31. Turbine and auxiliaries		135
32. Feedwater and Main Steam System		112
41. Main Generator Systems		14
42. Electrical Power Supply Systems		1
Total	0	302

**GB-22B HEYSHAM B-2**

Operator: EDF UK (EDF Energy)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

**1. Station Details**

Type: GCR

Net Reference Unit Power (RUP) at the beginning of 2014: 610.0 MW(e)

Design Net Capacity: 615.0 MW(e)

Design Discharge Burnup: 27000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 5211.8 GW(e)·h

Energy Availability Factor: 95.3%

Load Factor: 97.5%

Operating Factor: 99.5%

Energy Unavailability Factor: 4.7%

Total Off-line Time: 47 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	441.6	380.5	428.0	437.2	454.6	419.6	462.0	442.2	420.3	466.3	417.6	441.8	5211.8
EAF (%)	94.7	90.3	92.3	96.6	97.2	94.1	100.0	95.4	93.9	100.0	93.1	95.0	95.3
UCF (%)	94.7	90.3	92.3	96.6	97.2	94.1	100.0	95.4	93.9	100.0	93.1	95.0	95.3
LF (%)	97.3	92.8	94.4	99.5	100.2	95.5	101.8	97.4	95.7	102.6	95.1	97.4	97.5
OF (%)	100.0	93.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5
EUf (%)	5.3	9.7	7.7	3.4	2.8	5.9	0.0	4.6	6.1	0.0	6.9	5.0	4.7
PUf (%)	5.3	0.0	7.7	3.4	2.8	5.6	0.0	4.6	6.1	0.0	6.9	5.0	4.0
UCLF (%)	0.0	9.7	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.8
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 102335.7 GW(e)·h

Date of First Criticality: 01 Nov 1988      Cumulative Energy Availability Factor: 76.0%

Date of Grid Connection: 11 Nov 1988      Cumulative Load Factor: 75.0%

Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 76.9%

   Cumulative Energy Unavailability Factor: 24.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	2590.4	615	74.4	74.4	74.4	74.4	63.8	63.8	4878	73.9
1990	784.0	615	14.9	40.5	14.9	40.5	14.6	35.8	1901	21.8
1991	2424.0	615	53.7	45.3	53.4	45.2	45.1	39.2	4453	51.0
1992	3486.5	615	66.4	51.0	64.7	50.5	63.7	45.8	6198	69.6
1993	4384.9	622	91.6	59.6	79.6	56.6	80.6	53.1	7125	81.6
1994	4435.3	625	84.0	63.9	80.7	60.9	81.2	58.1	7723	88.4
1995	4498.8	625	82.2	66.6	82.3	64.1	81.9	61.6	7249	82.5
1996	4265.4	625	78.6	68.2	78.4	65.9	77.7	63.7	7103	80.9
1997	4780.7	625	87.4	70.4	85.5	68.2	87.1	66.4	8021	91.3
1998	4209.7	625	77.0	71.1	76.2	69.0	76.7	67.5	7574	86.2
1999	2987.2	625	54.7	69.5	54.6	67.7	54.4	66.3	4987	56.8
2000	5001.9	625	91.1	71.4	90.5	69.6	91.1	68.4	8660	98.6
2001	4234.2	625	91.4	73.0	90.8	71.3	77.1	69.1	7103	80.9
2002	5010.3	625	91.5	74.3	91.5	72.8	91.5	70.7	8521	97.3
2003	4582.8	625	83.9	75.0	83.8	73.5	83.7	71.6	7712	88.0
2004	4244.2	625	77.5	75.1	77.5	73.8	77.3	72.0	7383	84.1
2005	5056.8	625	92.3	76.1	92.3	74.9	92.4	73.2	8564	97.8
2006	4816.7	625	89.1	76.9	89.1	75.7	89.0	74.1	8293	94.7
2007	4046.7	615	74.9	76.8	74.9	75.6	75.1	74.1	7104	81.1
2008	4709.3	620	86.7	77.3	86.7	76.2	86.6	74.8	8252	93.9
2009	4012.1	620	76.8	77.2	74.2	76.1	73.9	74.7	7268	83.0
2010	1437.4	620	27.2	75.0	27.2	73.9	26.5	72.5	2719	31.0
2011	4545.7	605	85.0	75.4	85.0	74.3	85.8	73.1	7968	91.0
2012	5214.0	610	95.9	76.2	95.8	75.2	97.3	74.1	8784	100.0

2013	4057.2	610	75.2	76.2	75.2	75.2	75.9	74.1	6945	79.3
2014	5211.8	610	95.3	76.9	95.3	76.0	97.5	75.0	8713	99.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		46			592	
B. Refuelling without a maintenance				9	5	
C. Inspection, maintenance or repair combined with refuelling				675	19	
D. Inspection, maintenance or repair without refuelling				258		
E. Testing of plant systems or components					8	
J. Grid limitation, failure or grid unavailability						36
L. Human factor related					6	
P. Fire					1	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				18		
Z. Other						42
Subtotal	0	46	0	960	631	78
Total		46			1669	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems		6
16. Steam generation systems		18
31. Turbine and auxiliaries	46	249
32. Feedwater and Main Steam System		28
33. Circulating Water System		173
41. Main Generator Systems		89
42. Electrical Power Supply Systems		6
Total	46	588

# GB-16A HINKLEY POINT B-1

Operator: EDF UK (EDF Energy)

Contractor: TNPG (THE NUCLEAR POWER GROUP LTD.)

## 1. Station Details

Type: GCR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 475.0 MW(e)  
 Design Net Capacity: 625.0 MW(e)  
 Design Discharge Burnup: 38500 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 3751.2 GW(e)·h  
 Energy Availability Factor: 88.2%  
 Load Factor: 90.2%  
 Operating Factor: 91.0%  
 Energy Unavailability Factor: 11.8%  
 Total Off-line Time: 792 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	365.5	155.0	117.1	355.2	343.8	345.4	325.7	336.5	346.5	345.0	347.1	368.3	3751.2
EAF (%)	100.0	47.9	34.0	100.0	94.9	99.8	92.1	94.3	99.8	94.9	98.0	100.0	88.2
UCF (%)	100.0	47.9	34.0	100.0	94.9	99.8	92.1	94.3	99.8	94.9	98.0	100.0	88.2
LF (%)	103.4	48.6	33.2	103.8	97.3	101.0	92.2	95.2	101.3	97.5	101.5	104.2	90.2
OF (%)	100.0	49.7	38.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.0
EUf (%)	0.0	52.1	66.0	0.0	5.1	0.2	7.9	5.7	0.2	5.1	2.0	0.0	11.8
PUf (%)	0.0	52.1	66.0	0.0	5.1	0.1	7.9	5.7	0.1	5.1	2.0	0.0	11.8
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

CARRIED OUT AN INTERIM CORE INSPECTION OUTAGE

## 5. Historical Summary

Date of Construction Start: 01 Sep 1967      Lifetime Generation: 128230.1 GW(e)·h  
 Date of First Criticality: 24 Sep 1976      Cumulative Energy Availability Factor: 75.9%  
 Date of Grid Connection: 30 Oct 1976      Cumulative Load Factor: 77.1%  
 Date of Commercial Operation: 02 Oct 1978      Cumulative Unit Capability Factor: 76.5%  
    Cumulative Energy Unavailability Factor: 24.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1978			Data not provided							
1979	3079.8	400	79.4	79.4	73.5	73.5	88.1	88.1	6646	76.1
1980	2337.2	475	59.9	68.8	55.4	63.6	56.3	70.9	5394	61.7
1981	3441.6	520	78.5	72.5	74.3	67.7	74.3	72.2	7118	79.9
1982	2950.8	520	67.8	71.2	65.4	67.0	65.0	70.2	6000	68.7
1983	4083.0	520	88.3	74.8	86.6	71.2	89.9	74.4	8127	93.0
1984	3408.2	520	72.0	74.3	71.6	71.3	75.0	74.5	6589	75.4
1985	4263.0	520	82.3	75.5	82.2	72.9	93.8	77.4	8167	93.5
1986	3199.2	560	68.2	74.5	67.2	72.1	65.4	75.7	6110	69.9
1987	1838.0	560	39.6	70.2	38.8	68.0	36.9	70.9	3554	39.9
1988	2905.4	560	59.9	69.1	59.1	67.0	59.4	69.7	5370	61.5
1989	4195.3	560	85.6	70.7	85.5	68.8	85.8	71.2	7878	90.2
1990	3102.0	560	63.9	70.1	63.4	68.3	63.4	70.6	5732	65.6
1991	4601.9	560	94.3	72.1	94.3	70.5	94.1	72.5	8430	96.5
1992	3614.5	583	70.2	71.9	69.8	70.4	69.5	72.2	6565	73.7
1993	4843.3	585	94.8	73.6	94.6	72.2	94.0	73.8	8587	97.5
1994	4126.2	585	78.7	73.9	78.3	72.6	80.7	74.3	7342	84.0
1995	4812.5	610	90.1	75.0	89.6	73.7	89.8	75.3	7910	90.1
1996	4797.3	610	90.2	76.0	89.7	74.7	89.5	76.2	8418	95.8
1997	4185.7	610	78.4	76.1	78.3	74.9	78.1	76.3	7341	83.6
1998	4252.6	610	79.6	76.3	80.9	75.3	79.4	76.5	7740	88.1
1999	4045.2	610	75.8	76.3	77.0	75.4	75.5	76.4	7221	82.2
2000	3850.6	610	71.9	76.1	71.9	75.2	71.9	76.2	7208	82.1

2001	4802.0	610	87.0	76.6	87.0	75.7	89.6	76.9	8545	97.3
2002	4581.0	610	85.0	77.0	85.0	76.2	85.7	77.3	8021	91.6
2003	4076.4	610	74.8	76.9	74.8	76.1	76.3	77.2	7032	80.3
2004	4578.7	610	84.8	77.2	84.8	76.5	85.5	77.6	8091	92.1
2005	4580.6	610	85.2	77.5	85.2	76.8	85.7	77.9	8257	94.3
2006	3370.2	610	62.4	76.9	62.4	76.3	62.3	77.3	6200	70.8
2007	1877.4	430	45.2	76.0	45.2	75.4	44.9	76.3	5204	59.4
2008	2628.8	410	72.8	75.9	72.8	75.3	72.1	76.2	6935	79.0
2009	1931.5	410	55.4	75.4	53.7	74.8	53.8	75.7	4963	56.7
2010	3152.4	410	81.8	75.6	81.8	74.9	87.8	76.0	7411	84.6
2011	3330.0	435	86.8	75.9	86.8	75.2	87.4	76.3	7863	89.8
2012	2794.0	435	72.8	75.8	72.8	75.2	73.1	76.2	6693	76.2
2013	3880.0	440	94.7	76.2	94.7	75.6	100.7	76.7	8553	97.6
2014	3751.2	475	88.2	76.5	88.2	75.9	90.2	77.1	7968	91.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1978 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					491	
B. Refuelling without a maintenance				0		
C. Inspection, maintenance or repair combined with refuelling				195	23	
D. Inspection, maintenance or repair without refuelling	792			442		
E. Testing of plant systems or components					1	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					21	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						3
Z. Other				1	1	1
Subtotal	792	0	0	638	537	6
Total	792			1181		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1978 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		11
15. Reactor Cooling Systems		3
16. Steam generation systems		132
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries		149
32. Feedwater and Main Steam System		18
41. Main Generator Systems		81
42. Electrical Power Supply Systems		76
Total	0	487



# GB-16B HINKLEY POINT B-2

Operator: EDF UK (EDF Energy)

Contractor: TNPG (THE NUCLEAR POWER GROUP LTD.)

## 1. Station Details

Type: GCR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 470.0 MW(e)  
 Design Net Capacity: 625.0 MW(e)  
 Design Discharge Burnup: 38500 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4091.0 GW(e)·h  
 Energy Availability Factor: 96.7%  
 Load Factor: 99.4%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 3.3%  
 Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	343.0	319.5	362.6	327.3	360.7	325.5	346.7	334.9	345.2	324.1	336.2	365.3	4091.0
EAF (%)	95.0	97.9	100.0	94.1	100.0	94.9	98.7	94.3	100.0	90.2	95.8	100.0	96.7
UCF (%)	95.0	97.9	100.0	94.1	100.0	94.9	98.7	94.3	100.0	90.2	95.8	100.0	96.7
LF (%)	98.1	101.2	103.8	96.7	103.2	96.2	99.1	95.8	102.0	92.6	99.3	104.5	99.4
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUUF (%)	5.0	2.1	0.0	5.9	0.0	5.1	1.3	5.7	0.0	9.8	4.2	0.0	3.3
PUF (%)	5.0	1.9	0.0	5.9	0.0	5.1	1.3	5.5	0.0	8.2	4.2	0.0	3.1
UCLF (%)	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0	1.7	0.0	0.0	0.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Sep 1967      Lifetime Generation: 125192.1 GW(e)·h  
 Date of First Criticality: 01 Feb 1976      Cumulative Energy Availability Factor: 74.4%  
 Date of Grid Connection: 05 Feb 1976      Cumulative Load Factor: 73.5%  
 Date of Commercial Operation: 27 Sep 1976      Cumulative Unit Capability Factor: 75.5%  
    Cumulative Energy Unavailability Factor: 25.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1976			Data not provided							
1977	1044.0	400	74.6	74.6	74.6	74.6	29.9	29.9	2756	31.5
1978			Data not provided							
1979	1499.7	400	44.0	59.3	38.2	56.4	42.9	36.4	3512	40.2
1980	3008.9	475	71.3	63.8	69.3	61.2	72.5	49.9	6390	73.1
1981	2488.8	520	57.1	61.8	54.7	59.3	53.8	51.0	5054	56.8
1982	3155.1	520	73.6	64.5	69.8	61.6	69.5	55.1	6834	78.2
1983	3454.5	520	75.6	66.5	74.1	63.9	76.0	58.9	6839	78.3
1984	4393.5	520	89.6	70.1	89.4	67.8	96.7	64.8	8228	94.2
1985	3229.9	520	66.7	69.6	66.7	67.7	71.1	65.6	5950	68.1
1986	3497.3	560	81.2	71.1	75.1	68.6	72.5	66.5	7257	84.2
1987	2971.1	560	68.3	70.7	60.6	67.7	59.6	65.7	6333	71.1
1988	4268.2	560	91.1	72.8	86.6	69.6	87.2	67.9	8467	96.9
1989	2484.6	560	65.6	72.1	65.3	69.2	50.8	66.3	4896	56.0
1990	4463.5	560	92.4	73.8	91.2	71.1	91.2	68.4	8565	98.0
1991	2353.5	560	57.4	72.6	57.4	70.0	48.1	66.8	4432	50.7
1992	3902.0	583	76.6	72.9	76.3	70.5	75.1	67.4	7225	81.1
1993	3743.0	597	71.7	72.8	71.4	70.5	71.7	67.8	6575	75.3
1994	4852.2	610	91.5	74.0	91.1	71.9	91.1	69.3	8602	98.5
1995	4518.1	610	84.6	74.7	84.6	72.7	84.3	70.3	7411	84.4
1996	3119.9	610	58.9	73.8	59.1	71.9	58.2	69.6	5615	63.9
1997	4512.9	610	84.5	74.4	85.0	72.7	84.2	70.4	7958	90.6
1998	4738.9	610	88.7	75.1	88.3	73.5	88.4	71.3	8641	98.4
1999	4082.3	610	76.9	75.2	75.8	73.6	76.2	71.6	7402	84.3

2000	4189.4	610	78.9	75.4	78.9	73.9	78.2	71.9	7851	89.4
2001	4772.4	610	84.1	75.8	84.1	74.3	89.1	72.7	8406	95.7
2002	3257.3	610	61.2	75.2	61.2	73.8	61.0	72.2	6163	70.4
2003	4619.5	610	86.5	75.6	86.5	74.3	86.4	72.8	8575	97.9
2004	4150.5	610	77.7	75.7	77.7	74.4	77.5	73.0	8163	92.9
2005	3357.2	610	63.3	75.2	63.3	74.0	62.8	72.6	6544	74.7
2006	3132.9	610	61.5	74.7	59.8	73.5	59.4	72.1	6051	69.1
2007	1812.9	430	44.0	73.9	44.0	72.7	43.9	71.3	4806	54.9
2008	2709.9	410	74.1	73.9	74.1	72.7	74.3	71.4	6821	77.7
2009	3016.3	430	79.6	74.0	79.6	72.9	81.0	71.6	7268	83.0
2010	3263.2	430	84.8	74.3	84.8	73.1	86.6	72.0	7693	87.8
2011	2746.3	435	72.1	74.2	72.1	73.1	72.1	72.0	6580	75.1
2012	3480.5	435	90.4	74.6	90.4	73.5	91.1	72.4	8264	94.1
2013	3651.3	440	90.5	75.0	90.5	73.9	94.7	72.9	8196	93.6
2014	4091.0	470	96.7	75.5	96.7	74.4	99.4	73.5	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					655	
C. Inspection, maintenance or repair combined with refuelling				183	14	
D. Inspection, maintenance or repair without refuelling				194		
E. Testing of plant systems or components				3	9	
H. Nuclear regulatory requirements					54	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					2	
Z. Other				1	14	
Subtotal	0	0	0	381	748	2
Total		0			1131	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		40
12. Reactor I&C Systems		17
15. Reactor Cooling Systems		18
16. Steam generation systems		231
21. Fuel Handling and Storage Facilities		7
31. Turbine and auxiliaries		135
32. Feedwater and Main Steam System		128
33. Circulating Water System		1
41. Main Generator Systems		58
42. Electrical Power Supply Systems		13
XX. Miscellaneous Systems		2
Total	0	650

# GB-17A HUNTERSTON B-1

Operator: EDF UK (EDF Energy)

Contractor: TNPG (THE NUCLEAR POWER GROUP LTD.)

## 1. Station Details

Type: GCR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 475.0 MW(e)  
 Design Net Capacity: 624.0 MW(e)  
 Design Discharge Burnup: 38500 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 3798.2 GW(e)·h  
 Energy Availability Factor: 89.0%  
 Load Factor: 91.3%  
 Operating Factor: 92.5%  
 Energy Unavailability Factor: 11.0%  
 Total Off-line Time: 657 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	348.6	72.2	355.0	269.8	331.5	334.8	345.5	360.4	335.8	349.0	354.8	340.8	3798.2
EAF (%)	95.0	24.3	97.6	77.5	90.6	95.4	95.7	100.0	96.0	95.8	100.0	93.9	89.0
UCF (%)	95.0	24.3	97.6	77.5	90.6	95.4	95.7	100.0	96.0	95.8	100.0	93.9	89.0
LF (%)	98.6	22.6	100.6	78.9	93.8	97.9	97.8	102.0	98.2	98.6	103.8	96.4	91.3
OF (%)	95.0	31.5	99.6	85.6	92.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.5
EUUF (%)	5.0	75.7	2.4	22.5	9.4	4.6	4.3	0.0	4.0	4.2	0.0	6.1	11.0
PUF (%)	0.0	57.6	1.8	3.8	0.0	4.2	4.3	0.0	4.0	4.2	0.0	5.2	6.7
UCLF (%)	5.0	18.2	0.5	18.7	9.4	0.4	0.0	0.0	0.0	0.0	0.0	1.0	4.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

CARRIED OUT AN INTERIM CORE INSPECTION OUTAGE

## 5. Historical Summary

Date of Construction Start: 01 Nov 1967      Lifetime Generation: 128941.7 GW(e)·h  
 Date of First Criticality: 31 Jan 1976      Cumulative Energy Availability Factor: 72.0%  
 Date of Grid Connection: 06 Feb 1976      Cumulative Load Factor: 71.0%  
 Date of Commercial Operation: 06 Feb 1976      Cumulative Unit Capability Factor: 72.3%  
    Cumulative Energy Unavailability Factor: 28.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1976	1349.0	459	36.0	36.0	36.0	36.0	35.7	35.7	4293	52.2
1977	1709.2	500	40.1	38.2	40.1	38.2	39.1	37.5	4313	49.4
1978	2158.4	500	49.4	42.1	49.4	42.1	49.4	41.7	5375	61.5
1979	2250.0	500	52.2	44.7	52.2	44.7	51.5	44.2	5259	60.2
1980	1486.0	500	34.4	42.6	34.4	42.6	34.0	42.1	3750	42.9
1981	1794.8	500	40.8	42.3	40.8	42.3	40.3	41.8	3941	44.3
1982	3484.1	515	77.3	47.5	77.3	47.5	77.4	47.1	7408	84.8
1983	2912.0	520	63.1	49.5	63.1	49.5	64.1	49.3	6107	69.9
1984	4214.0	550	85.5	53.9	85.5	53.9	87.7	54.0	8080	92.5
1985	3644.2	575	71.1	55.8	71.1	55.8	72.5	56.1	6655	76.2
1986	4571.2	575	89.1	59.2	89.1	59.2	91.0	59.6	8268	94.6
1987	3268.4	575	63.7	59.6	63.7	59.6	63.8	60.0	6358	71.4
1988	4492.3	575	89.2	62.1	89.2	62.1	89.4	62.5	8568	98.1
1989	2959.7	575	58.2	61.8	58.2	61.8	58.9	62.2	5467	62.6
1990	4744.1	575	92.7	64.0	92.7	64.0	94.4	64.5	8585	98.3
1991	2033.8	575	40.1	62.4	40.1	62.4	40.5	62.9	3827	43.8
1992	4315.7	575	92.0	64.3	84.4	63.8	84.3	64.3	8771	98.5
1993	2928.9	575	59.5	64.0	58.2	63.5	58.3	63.9	5581	63.9
1994	4698.1	582	92.8	65.7	92.4	65.1	92.3	65.5	8545	97.8
1995	3830.0	585	74.2	66.1	74.2	65.6	72.5	65.9	6917	76.6
1996	1643.7	585	98.5	67.8	98.5	67.3	32.0	64.2	2839	32.3
1997	3834.0	595	73.6	68.1	73.6	67.6	73.4	64.6	7035	80.1
1998	4835.4	595	92.8	69.3	92.8	68.8	92.5	66.0	8584	97.7

1999	4811.5	595	92.3	70.3	92.3	69.9	92.1	67.1	8591	97.8
2000	4035.6	595	77.2	70.6	77.2	70.2	77.2	67.6	7497	85.3
2001	5030.4	595	86.6	71.3	86.6	70.9	96.2	68.7	8598	97.9
2002	4678.5	595	89.1	72.0	89.1	71.6	89.8	69.6	8356	95.4
2003	3936.5	595	74.7	72.1	74.6	71.7	75.5	69.8	7225	82.5
2004	4522.7	595	85.8	72.6	85.6	72.2	86.5	70.4	8271	94.2
2005	4096.4	595	78.8	72.8	78.4	72.4	78.6	70.7	8207	93.7
2006	1991.4	595	37.8	71.6	37.8	71.2	37.5	69.6	3838	43.8
2007	1303.3	420	32.5	70.5	32.5	70.2	31.9	68.6	4315	49.3
2008	2213.4	410	60.9	70.3	60.9	70.0	61.1	68.4	5894	67.1
2009	2828.0	430	73.9	70.4	73.9	70.1	75.9	68.6	6969	79.6
2010	3635.5	430	90.5	70.9	90.5	70.6	96.5	69.2	8409	96.0
2011	3382.3	460	83.6	71.2	83.6	70.9	83.9	69.5	7698	87.9
2012	3255.0	460	79.3	71.3	79.3	71.1	80.6	69.8	7350	83.7
2013	4058.3	460	96.3	71.9	96.3	71.6	100.7	70.5	8760	100.0
2014	3798.2	475	89.0	72.3	89.0	72.0	91.3	71.0	8103	92.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1976 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		317			498	
C. Inspection, maintenance or repair combined with refuelling				352	19	
D. Inspection, maintenance or repair without refuelling	340			701	12	
E. Testing of plant systems or components				68	6	
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						3
L. Human factor related					2	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				1	2	
Z. Other				78	11	
Subtotal	340	317	0	1200	550	7
Total		657			1757	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1976 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		4
14. Safety Systems		1
15. Reactor Cooling Systems	53	54
16. Steam generation systems		212
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries	156	81
32. Feedwater and Main Steam System		38
33. Circulating Water System		13
35. All other I&C Systems		2
41. Main Generator Systems	107	36
42. Electrical Power Supply Systems		22
XX. Miscellaneous Systems		4
Total	316	492

# GB-17B HUNTERSTON B-2

Operator: EDF UK (EDF Energy)

Contractor: TNPG (THE NUCLEAR POWER GROUP LTD.)

## 1. Station Details

Type: GCR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 485.0 MW(e)  
 Design Net Capacity: 624.0 MW(e)  
 Design Discharge Burnup: 38500 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 2832.4 GW(e)·h  
 Energy Availability Factor: 66.5%  
 Load Factor: 66.7%  
 Operating Factor: 69.8%  
 Energy Unavailability Factor: 33.5%  
 Total Off-line Time: 2646 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	337.8	334.4	150.2	340.1	368.2	336.3	365.6	3.9	-5.1	-21.5	326.4	296.1	2832.4
EAF (%)	93.2	100.0	42.0	95.3	100.0	95.0	100.0	1.9	0.0	0.0	92.7	81.3	66.5
UCF (%)	93.2	100.0	42.0	95.3	100.0	95.0	100.0	1.9	0.0	0.0	92.7	81.3	66.5
LF (%)	93.6	102.6	41.7	97.4	102.0	96.3	101.3	1.1	-1.5	-6.0	93.5	82.1	66.7
OF (%)	100.0	100.0	52.4	100.0	100.0	100.0	100.0	2.4	0.0	0.7	96.3	89.4	69.8
EUf (%)	6.8	0.0	58.0	4.7	0.0	5.0	0.0	98.1	100.0	100.0	7.3	18.7	33.5
PUf (%)	6.7	0.0	58.0	4.7	0.0	4.4	0.0	98.1	100.0	46.1	0.1	3.8	27.0
UCLF (%)	0.1	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	53.9	7.2	14.9	6.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

CARRIED OUT A STATUTORY OUTAGE

## 5. Historical Summary

Date of Construction Start: 01 Nov 1967      Lifetime Generation: 122061.9 GW(e)·h  
 Date of First Criticality: 27 Mar 1977      Cumulative Energy Availability Factor: 72.0%  
 Date of Grid Connection: 31 Mar 1977      Cumulative Load Factor: 70.0%  
 Date of Commercial Operation: 31 Mar 1977      Cumulative Unit Capability Factor: 72.1%  
    Cumulative Energy Unavailability Factor: 28.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	1047.7	500	29.2	29.2	29.2	29.2	28.4	28.4	3071	41.7
1978	0.0	500	0.0	13.4	0.0	13.4	0.0	13.0	0	0.0
1979	0.0	500	0.0	8.7	0.0	8.7	0.0	8.4	0	0.0
1980	2544.0	500	58.9	21.7	58.9	21.7	58.2	21.4	5147	58.9
1981	3019.9	500	68.2	31.5	68.2	31.5	67.8	31.1	7219	81.1
1982	2706.2	515	59.8	36.4	59.8	36.4	60.1	36.2	5596	64.0
1983	4153.0	520	88.4	44.2	88.4	44.2	91.4	44.5	8524	97.6
1984	3287.0	550	67.7	47.4	67.7	47.4	68.4	47.7	6365	72.9
1985	4507.7	575	88.7	52.6	88.7	52.6	89.7	53.0	8303	95.0
1986	3616.1	575	70.8	54.6	70.8	54.6	72.0	55.1	6496	74.4
1987	4623.4	575	90.8	58.3	90.5	58.3	90.3	58.7	8710	97.8
1988	3115.5	575	61.3	58.6	61.3	58.5	62.0	59.0	5754	65.9
1989	4728.0	575	93.5	61.5	93.5	61.5	94.1	61.9	8643	98.9
1990	3231.3	575	63.8	61.7	63.8	61.6	64.3	62.1	5858	67.1
1991	4727.8	575	94.7	64.0	94.0	64.0	94.1	64.4	8707	99.7
1992	1969.7	575	39.2	62.3	39.2	62.3	38.5	62.6	3733	41.9
1993	4322.1	575	86.7	63.9	86.1	63.8	86.0	64.1	8128	93.0
1994	3784.7	582	74.9	64.5	74.7	64.4	74.4	64.7	6949	79.5
1995	4671.3	585	90.1	66.0	90.1	65.9	87.9	66.1	8315	91.6
1996	1276.6	585	91.9	67.4	91.9	67.3	24.8	63.9	2377	27.1
1997	4559.7	595	87.5	68.4	87.5	68.3	87.2	65.1	8200	93.4
1998	4518.0	595	86.7	69.3	86.7	69.2	86.4	66.1	8149	92.8
1999	4102.0	595	78.8	69.8	78.8	69.7	78.5	66.7	7302	83.1

2000	3241.6	595	62.0	69.4	62.0	69.3	62.0	66.5	6411	73.0
2001	3785.0	595	83.7	70.0	83.7	70.0	72.4	66.7	6485	73.8
2002	4413.1	595	83.1	70.6	83.1	70.5	84.7	67.5	7721	88.1
2003	4627.3	595	87.8	71.2	87.5	71.2	88.8	68.3	8381	95.7
2004	4238.7	595	83.7	71.7	83.5	71.6	81.1	68.8	7799	88.8
2005	3633.6	595	70.0	71.7	69.4	71.6	69.7	68.8	7017	80.1
2006	3746.0	595	71.0	71.6	71.0	71.5	71.0	68.9	6753	77.1
2007	1658.4	420	41.3	70.8	41.3	70.7	40.7	68.1	4642	53.0
2008	2240.7	410	61.9	70.6	61.9	70.5	61.8	68.0	6054	68.9
2009	3217.6	430	85.4	71.0	85.4	70.9	86.4	68.4	8065	92.1
2010	3218.7	430	85.1	71.3	85.1	71.2	85.4	68.8	7876	89.9
2011	2959.9	430	79.2	71.5	78.3	71.4	78.6	69.0	7211	82.3
2012	3635.8	430	95.4	72.0	95.4	71.9	96.3	69.6	8784	100.0
2013	3432.8	430	83.4	72.2	83.4	72.1	91.1	70.1	7601	86.8
2014	2832.4	485	66.5	72.1	66.5	72.0	66.7	70.0	6114	69.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		507			826	
B. Refuelling without a maintenance				0		
C. Inspection, maintenance or repair combined with refuelling	1783			270	18	
D. Inspection, maintenance or repair without refuelling	354			626	16	
E. Testing of plant systems or components				0	1	
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						5
L. Human factor related					5	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other				23	3	0
Subtotal	2137	507	0	919	869	9
Total	2644			1797		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		6
14. Safety Systems		0
15. Reactor Cooling Systems		29
16. Steam generation systems		113
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries	428	52
32. Feedwater and Main Steam System	79	574
33. Circulating Water System		2
35. All other I&C Systems		1
41. Main Generator Systems		6
42. Electrical Power Supply Systems		11
XX. Miscellaneous Systems		21
Total	507	819

**GB-24 SIZEWELL B**

Operator: EDF UK (EDF Energy)

Contractor: PPC (PWR POWER PROJECTS Ltd)

**1. Station Details**

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1198.0 MW(e)

Design Net Capacity: 1188.0 MW(e)

Design Discharge Burnup: 33000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 8828.1 GW(e)·h

Energy Availability Factor: 84.1%

Load Factor: 84.1%

Operating Factor: 86.6%

Energy Unavailability Factor: 15.9%

Total Off-line Time: 1171 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	895.9	753.9	893.4	866.0	892.6	859.6	840.9	883.9	855.5	393.2	-9.2	702.4	8828.1
EAF (%)	100.0	93.1	100.0	100.0	100.0	99.7	94.3	99.2	99.2	44.4	0.0	78.9	84.1
UCF (%)	100.0	93.1	100.0	100.0	100.0	99.7	94.4	99.2	99.2	44.4	0.0	78.9	84.1
LF (%)	100.5	93.6	100.4	100.4	100.1	99.7	94.3	99.2	99.2	44.1	-1.1	78.8	84.1
OF (%)	100.0	94.6	100.0	100.0	100.0	100.0	97.0	100.0	100.0	54.4	0.0	92.9	86.6
EUf (%)	0.0	6.9	0.0	0.0	0.0	0.3	5.7	0.8	0.8	55.6	100.0	21.1	15.9
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.3	5.7	0.8	0.5	55.3	100.0	9.4	14.3
UCLF (%)	0.0	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	11.7	1.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

CARRIED OUT A STATUTORY/REFUELLING OUTAGE

**5. Historical Summary**

Date of Construction Start: 18 Jul 1988      Lifetime Generation: 145429.5 GW(e)·h

Date of First Criticality: 31 Jan 1995      Cumulative Energy Availability Factor: 84.0%

Date of Grid Connection: 14 Feb 1995      Cumulative Load Factor: 82.6%

Date of Commercial Operation: 22 Sep 1995      Cumulative Unit Capability Factor: 84.1%

Cumulative Energy Unavailability Factor: 16.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1995	0.0	1188	100.0	100.0	99.6	99.6	0.0	0.0	0	0.0
1996	8488.5	1188	81.3	86.0	81.4	85.9	81.3	61.0	7367	83.9
1997	8469.8	1188	81.4	84.0	81.5	84.0	81.2	69.6	6992	79.6
1998	10123.1	1188	97.3	88.0	97.4	88.0	97.0	77.9	8705	99.1
1999	7959.0	1188	76.5	85.4	76.5	85.4	76.3	77.5	7134	81.2
2000	8527.2	1188	81.7	84.7	81.6	84.7	81.7	78.3	7612	86.7
2001	9198.0	1188	77.4	83.5	77.2	83.5	88.1	79.8	7784	88.6
2002	9195.0	1188	88.9	84.3	88.5	84.2	88.4	81.0	7862	89.7
2003	8854.2	1188	89.3	84.9	88.7	84.7	85.1	81.5	7613	86.9
2004	9329.1	1188	89.4	85.4	89.4	85.2	89.4	82.3	8685	98.9
2005	8696.3	1188	83.9	85.2	83.9	85.1	83.6	82.5	7476	85.3
2006	8908.3	1188	85.2	85.2	85.2	85.1	85.2	82.7	7570	86.4
2007	10264.3	1188	98.5	86.3	98.5	86.2	98.5	84.0	8760	100.0
2008	9301.2	1188	89.2	86.5	89.2	86.4	89.1	84.4	8097	92.2
2009	9094.9	1188	87.3	86.6	87.3	86.5	87.4	84.6	7863	89.8
2010	4774.8	1188	45.6	83.9	45.6	83.8	45.9	82.1	4032	46.0
2011	8627.4	1191	82.5	83.8	82.5	83.7	82.7	82.1	7463	85.2
2012	9346.2	1191	89.2	84.1	89.2	84.1	89.3	82.5	8348	95.0
2013	8714.7	1198	83.0	84.1	83.0	84.0	83.0	82.5	7612	86.9
2014	8828.1	1198	84.1	84.1	84.1	84.0	84.1	82.6	7589	86.6

**6. Full Outages, Analysis by Cause**

	2014 Hours Lost	1995 to 2014
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Outage Cause	2014 Hours Lost			Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		36			433	
C. Inspection, maintenance or repair combined with refuelling	1113			436	63	
D. Inspection, maintenance or repair without refuelling	22			190		
E. Testing of plant systems or components					3	
L. Human factor related					1	
Subtotal	1135	36	0	626	500	0
Total		1171			1126	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1995 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		23
13. Reactor Auxiliary Systems		5
14. Safety Systems		43
15. Reactor Cooling Systems	36	245
16. Steam generation systems		7
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		16
41. Main Generator Systems		77
42. Electrical Power Supply Systems		12
XX. Miscellaneous Systems		0
Total	36	430



**GB-23A TORNESS-1**

Operator: EDF UK (EDF Energy)

Contractor: NNC (NATIONAL NUCLEAR CORPORATION)

**1. Station Details**

Type: GCR

Net Reference Unit Power (RUP) at the beginning of 2014: 590.0 MW(e)

Design Net Capacity: 645.0 MW(e)

Design Discharge Burnup: 27000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 3758.7 GW(e)·h

Energy Availability Factor: 73.0%

Load Factor: 72.7%

Operating Factor: 77.9%

Energy Unavailability Factor: 27.0%

Total Off-line Time: 1937 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	434.3	94.3	-4.2	109.0	438.4	384.3	257.4	387.4	417.2	403.3	415.0	422.3	3758.7
EAF (%)	98.9	24.6	0.0	27.5	99.8	90.5	59.3	88.2	98.2	91.6	97.4	96.0	73.0
UCF (%)	98.9	24.6	0.0	27.5	99.8	90.5	59.4	88.3	98.2	91.6	97.7	96.0	73.0
LF (%)	98.9	23.8	-1.0	25.7	99.9	90.5	58.6	88.3	98.2	91.8	97.7	96.2	72.7
OF (%)	100.0	25.0	0.0	36.9	100.0	100.0	68.3	100.0	100.0	100.0	100.0	100.0	77.9
EUUF (%)	1.1	75.4	100.0	72.5	0.2	9.5	40.7	11.8	1.8	8.4	2.6	4.0	27.0
PUF (%)	0.4	75.2	100.0	62.2	0.0	8.2	0.0	9.6	0.1	8.4	2.3	4.0	22.1
UCLF (%)	0.7	0.2	0.0	10.3	0.2	1.3	40.7	2.2	1.7	0.0	0.0	0.0	4.8
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

CARRIED OUT A STATUTORY OUTAGE

**5. Historical Summary**

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 100094.3 GW(e)·h

Date of First Criticality: 25 Mar 1988      Cumulative Energy Availability Factor: 74.9%

Date of Grid Connection: 25 May 1988      Cumulative Load Factor: 71.5%

Date of Commercial Operation: 25 May 1988      Cumulative Unit Capability Factor: 76.7%

Cumulative Energy Unavailability Factor: 25.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	2287.1	638	92.5	92.5	69.1	69.1	66.2	66.2	4330	80.9
1989	2162.1	625	53.2	68.5	39.5	51.0	39.6	49.9	4582	52.4
1990	1938.4	625	35.7	56.0	35.7	45.1	35.5	44.4	3943	45.1
1991	2513.6	625	46.0	53.2	46.0	45.4	46.0	44.9	5011	57.4
1992	4532.9	632	81.7	59.5	81.7	53.4	80.6	52.8	7792	87.5
1993	3603.1	632	67.9	61.1	67.7	56.0	62.9	54.6	6358	70.2
1994	4329.9	632	86.7	64.9	79.5	59.6	78.4	58.2	7716	88.3
1995	4058.6	632	75.2	66.3	75.2	61.6	71.5	60.0	6867	76.5
1996	1178.1	632	96.6	69.8	96.6	65.7	21.2	55.5	2043	23.3
1997	4909.4	625	89.7	71.9	89.7	68.2	89.4	59.0	8050	91.6
1998	4297.9	625	78.6	72.5	78.6	69.1	78.3	60.8	7153	81.4
1999	5157.8	625	94.2	74.3	94.2	71.3	93.9	63.6	8737	99.5
2000	4376.8	625	79.7	74.8	79.7	71.9	79.7	64.9	8769	99.8
2001	3968.5	625	70.2	74.4	70.2	71.8	72.3	65.4	7613	86.7
2002	3761.9	625	69.6	74.1	68.7	71.6	68.7	65.6	6719	76.7
2003	4681.9	625	85.8	74.8	85.6	72.5	85.5	66.9	8347	95.3
2004	3921.8	625	71.7	74.7	71.7	72.4	71.4	67.2	6993	79.6
2005	4667.7	625	85.3	75.3	85.3	73.2	85.3	68.2	8372	95.6
2006	4000.9	625	76.7	75.3	73.3	73.2	73.1	68.5	7939	90.6
2007	3500.9	625	65.3	74.8	64.2	72.7	63.9	68.2	6234	71.2
2008	4488.1	615	83.5	75.2	82.9	73.2	82.7	68.9	8110	92.3
2009	4963.6	600	93.9	76.1	93.9	74.1	93.9	70.0	8760	100.0
2010	2565.4	600	48.8	74.9	48.8	73.1	48.8	69.1	5302	60.5

2011	4582.9	600	88.9	75.5	88.0	73.7	87.2	69.9	8393	95.8
2012	4878.0	595	93.3	76.2	93.3	74.4	93.3	70.8	8784	100.0
2013	4637.7	590	93.8	76.8	89.8	75.0	89.7	71.5	8451	96.5
2014	3758.7	590	73.0	76.7	73.0	74.9	72.7	71.5	6823	77.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		235			257	
B. Refuelling without a maintenance				25		
C. Inspection, maintenance or repair combined with refuelling	1695	5		555	25	
D. Inspection, maintenance or repair without refuelling				185		
E. Testing of plant systems or components					1	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					36	
M. Governmental requirements or court decisions						12
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						14
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					11	
Z. Other				93	29	53
Subtotal	1695	240	0	858	359	81
Total		1935			1298	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		22
14. Safety Systems		5
15. Reactor Cooling Systems		64
16. Steam generation systems	59	5
31. Turbine and auxiliaries	8	17
32. Feedwater and Main Steam System		8
41. Main Generator Systems	167	62
42. Electrical Power Supply Systems		68
Total	234	254

**GB-23B TORNESS-2**

Operator: EDF UK (EDF Energy)

Contractor: NNC (NATIONAL NUCLEAR CORPORATION)

**1. Station Details**

Type: GCR

Net Reference Unit Power (RUP) at the beginning of 2014: 595.0 MW(e)

Design Net Capacity: 645.0 MW(e)

Design Discharge Burnup: 27000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 4718.7 GW(e)·h

Energy Availability Factor: 90.4%

Load Factor: 90.5%

Operating Factor: 94.5%

Energy Unavailability Factor: 9.6%

Total Off-line Time: 486 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	416.8	398.6	340.4	426.2	413.6	424.7	229.3	445.0	396.6	445.8	364.6	417.2	4718.7
EAF (%)	93.8	99.6	77.5	99.4	93.4	99.1	52.4	100.0	92.2	100.0	85.1	93.6	90.4
UCF (%)	93.8	99.6	77.5	99.4	93.4	99.1	52.4	100.0	92.2	100.0	86.3	93.6	90.5
LF (%)	94.2	99.7	77.0	99.5	93.4	99.1	51.8	100.5	92.6	100.6	85.1	94.2	90.5
OF (%)	100.0	100.0	88.0	100.0	100.0	100.0	58.5	100.0	100.0	100.0	87.8	100.0	94.5
EUf (%)	6.2	0.4	22.5	0.6	6.6	0.9	47.6	0.0	7.8	0.0	14.9	6.4	9.6
PUf (%)	6.2	0.2	6.5	0.2	6.6	0.9	47.6	0.0	7.8	0.0	0.1	6.4	7.0
UCLF (%)	0.0	0.2	16.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	13.7	0.0	2.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.1

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 98989.3 GW(e)·h

Date of First Criticality: 23 Dec 1988      Cumulative Energy Availability Factor: 75.4%

Date of Grid Connection: 03 Feb 1989      Cumulative Load Factor: 72.3%

Date of Commercial Operation: 03 Feb 1989      Cumulative Unit Capability Factor: 76.6%

   Cumulative Energy Unavailability Factor: 24.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	3633.8	625	87.4	87.4	74.2	74.2	73.3	73.3	7068	89.1
1990	1948.3	625	36.1	60.5	36.1	54.2	35.7	53.6	4211	48.2
1991	2651.3	625	48.4	56.3	48.4	52.2	48.6	51.9	5068	58.0
1992	3732.7	625	67.0	59.1	67.0	56.1	67.1	55.8	6560	73.7
1993	4038.0	632	74.4	62.2	74.4	59.8	73.1	59.4	7168	82.1
1994	3478.1	632	71.2	63.8	65.5	60.8	62.8	59.9	6264	71.5
1995	4651.9	632	85.9	67.1	85.9	64.5	81.3	63.1	7909	87.4
1996	1571.3	632	96.2	70.8	96.2	68.5	28.3	58.7	2409	27.4
1997	4218.0	625	77.7	71.5	77.7	69.6	76.8	60.7	7181	81.8
1998	5094.4	625	93.7	73.8	93.7	72.0	92.8	64.0	8713	99.2
1999	4984.0	625	91.1	75.3	91.1	73.7	90.8	66.4	8588	97.8
2000	3936.1	625	71.7	75.0	71.7	73.6	71.7	66.8	7686	87.5
2001	4293.6	625	77.2	75.2	76.6	73.8	78.2	67.7	8476	96.5
2002	1945.6	625	37.0	72.5	35.7	71.1	35.5	65.4	3751	42.8
2003	3782.8	625	69.4	72.3	69.4	71.0	69.1	65.7	6874	78.5
2004	4083.0	625	74.6	72.4	74.6	71.2	74.4	66.2	7682	87.5
2005	4821.9	625	87.9	73.3	87.9	72.2	88.1	67.5	8570	97.8
2006	3297.0	625	64.4	72.8	60.5	71.5	60.2	67.1	6456	73.7
2007	4829.0	625	89.2	73.7	88.3	72.4	88.2	68.2	8480	96.8
2008	4780.8	615	88.4	74.4	88.2	73.2	88.1	69.2	8494	96.7
2009	4151.2	605	78.3	74.6	78.3	73.4	78.0	69.6	7303	83.4
2010	4531.2	605	87.1	75.1	85.5	74.0	85.5	70.3	8345	95.3
2011	4417.9	605	85.7	75.6	83.5	74.4	83.4	70.9	8235	94.0
2012	3717.8	595	71.4	75.4	71.4	74.2	71.1	70.9	6632	75.5

2013	4672.9	595	91.8	76.1	89.7	74.8	89.7	71.6	8287	94.6
2014	4718.7	595	90.5	76.6	90.4	75.4	90.5	72.3	8274	94.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		177			322	
C. Inspection, maintenance or repair combined with refuelling				576	34	
D. Inspection, maintenance or repair without refuelling	309			197		
E. Testing of plant systems or components					5	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				17	18	
L. Human factor related					3	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						32
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				6		
Z. Other					12	22
Subtotal	309	177	0	796	394	54
Total		486			1244	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		28
12. Reactor I&C Systems	89	10
13. Reactor Auxiliary Systems		6
15. Reactor Cooling Systems		202
16. Steam generation systems		23
17. Safety I&C Systems (excluding reactor I&C)		16
21. Fuel Handling and Storage Facilities		3
32. Feedwater and Main Steam System		9
41. Main Generator Systems		6
42. Electrical Power Supply Systems	88	14
XX. Miscellaneous Systems		0
Total	177	317

**GB-13A WYLFA-1****Operator:** ML (Magnox Limited)**Contractor:** EE/B&W/T (THE ENGLISH ELECTRIC CO. LTD / BABCOCK & WILCOX CO. / TAYLOR WOODROW CONSTRUCTION)**1. Station Details**

**Type:** GCR

**Net Reference Unit Power (RUP) at the beginning of 2014:** 490.0 MW(e)

**Design Net Capacity:** 550.0 MW(e)

**Design Discharge Burnup:** 54000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 1643.6 GW(e)·h

**Energy Availability Factor:** 38.3%

**Load Factor:** 38.3%

**Operating Factor:** 49.7%

**Energy Unavailability Factor:** 61.7%

**Total Off-line Time:** 4405 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	51.7	0.0	0.0	0.0	0.0	3.9	133.7	277.1	295.2	293.8	295.4	292.8	1643.6
<b>EAF (%)</b>	14.2	0.0	0.0	0.0	0.0	1.1	36.7	76.0	83.7	80.6	83.7	80.3	38.3
<b>UCF (%)</b>	14.2	0.0	0.0	0.0	0.0	1.1	36.7	76.0	83.7	80.6	83.7	80.3	38.3
<b>LF (%)</b>	14.2	0.0	0.0	0.0	0.0	1.1	36.7	76.0	83.7	80.6	83.7	80.3	38.3
<b>OF (%)</b>	18.1	0.0	0.0	0.0	0.0	6.8	67.1	100.0	100.0	100.0	100.0	100.0	49.7
<b>EUAF (%)</b>	85.8	100.0	100.0	100.0	100.0	98.9	63.3	24.0	16.3	19.4	16.3	19.7	61.7
<b>PUF (%)</b>	83.7	100.0	100.0	52.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.6
<b>UCLF (%)</b>	2.1	0.0	0.0	47.9	100.0	98.9	63.3	24.0	16.3	19.4	16.3	19.7	34.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation**

REACTOR 1 CONTINUES TO OPERATE AT NOMINAL FULL POWER UTILISING PARTIALLY IRRADIATED FUEL TRANSFERRED FROM THE SHUT DOWN REACTOR 2. ONLY ONE UNPLANNED MANUAL REACTOR TRIP AND ONE PLANNED MANUAL SHUTDOWN (FOR THE BIENNIAL OUTAGE) OVER THE YEAR. GENERATION AT WYLFA CANNOT BE SEGREGATED INTO R1 OR R2 AS BOTH REACTORS SUPPLY STEAM TO ALL FOUR TURBINES. TOTAL SITE SENT OUT GENERATION SINCE START OF LIFE IS 232698 GWHRS.

**5. Historical Summary**

**Date of Construction Start:** 01 Sep 1963 **Lifetime Generation:** 123201.0 GW(e)·h

**Date of First Criticality:** 01 Nov 1969 **Cumulative Energy Availability Factor:** 69.8%

**Date of Grid Connection:** 24 Jan 1971 **Cumulative Load Factor:** 70.1%

**Date of Commercial Operation:** 01 Nov 1971 **Cumulative Unit Capability Factor:** 70.2%

**Cumulative Energy Unavailability Factor:** 30.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1971	342.4	495	47.2	47.2	47.2	47.2	47.2	47.2	1273	87.0
1972	1513.2	495	35.0	36.7	35.0	36.7	35.0	36.7	0	0.0
1973	1118.5	420	33.1	35.2	30.5	34.1	30.5	34.1	0	0.0
1974	2182.0	420	59.5	42.4	59.5	41.6	59.5	41.6	8568	98.1
1975	791.5	420	21.6	37.6	21.6	37.0	21.6	37.0	4437	50.8
1976	2409.0	420	66.8	43.1	66.8	42.7	64.4	42.2	8633	97.0
1977	2492.0	420	73.5	47.9	70.0	46.9	67.9	46.2	8008	91.7
1978	1900.5	420	52.5	48.5	52.5	47.7	51.8	47.0	7739	88.6
1979	2600.0	420	74.9	51.7	74.9	50.9	70.9	49.8	8694	99.5
1980	2882.0	420	78.1	54.5	78.1	53.8	78.5	52.9	8609	98.5
1981	3117.0	420	83.2	57.3	83.2	56.7	83.3	55.9	8823	99.1
1982	3020.0	420	81.7	59.4	81.7	58.9	81.4	58.1	8700	98.5
1983	3148.0	420	83.9	61.4	83.9	60.9	85.8	60.4	8715	99.8
1984	3378.5	420	89.5	63.5	89.5	63.1	92.1	62.7	8728	99.9
1985	3341.3	420	88.5	65.2	88.4	64.8	91.1	64.7	8736	100.0
1986	2050.0	420	62.1	65.0	61.9	64.6	55.7	64.1	7939	90.6
1987	2249.7	420	59.1	64.7	58.8	64.3	60.2	63.9	8611	96.7
1988	3086.2	420	84.3	65.8	83.8	65.4	84.1	65.0	8530	97.6
1989	3307.0	420	86.9	66.9	86.9	66.6	89.6	66.4	8572	97.6

1990	3373.2	420	89.9	68.1	89.9	67.8	91.9	67.7	8549	97.9
1991	3725.7	420	91.5	69.3	89.7	68.8	101.5	69.3	8374	95.9
1992	3897.6	475	92.3	70.5	92.1	70.1	92.2	70.5	8904	100.0
1993	3607.6	475	87.0	71.3	86.8	70.9	86.9	71.4	8477	97.0
1994	3055.5	475	76.1	71.5	72.4	71.0	73.6	71.5	6933	79.4
1995	2928.8	475	69.7	71.5	69.7	70.9	70.4	71.4	6216	71.0
1996	3973.8	475	93.2	72.4	93.2	71.9	95.2	72.5	8438	96.1
1997	3534.8	490	81.9	72.8	81.9	72.3	82.3	72.9	7353	83.9
1998	3725.2	490	86.3	73.4	86.3	72.9	86.8	73.5	8079	92.2
1999	3130.3	490	72.7	73.3	72.7	72.9	72.9	73.4	7632	87.1
2000	1001.0	490	23.3	71.4	23.3	71.0	23.3	71.5	2460	28.0
2001	1306.5	490	30.4	69.9	30.4	69.5	30.4	70.0	3451	39.4
2002	4058.3	490	95.3	70.8	94.5	70.4	94.5	70.9	8541	97.5
2003	2916.0	490	68.2	70.7	67.9	70.3	67.9	70.8	6389	72.9
2004	4144.3	490	97.0	71.6	96.1	71.2	96.3	71.6	8784	100.0
2005	2967.9	490	69.7	71.6	69.1	71.1	69.1	71.5	7200	82.2
2006	3730.4	490	86.9	72.0	86.9	71.6	86.9	72.0	8598	98.2
2007	1569.9	490	36.6	71.0	36.6	70.5	36.6	71.0	4401	50.2
2008	3944.4	490	92.3	71.6	91.6	71.1	91.6	71.6	8784	100.0
2009	2343.0	490	54.9	71.1	54.6	70.7	54.6	71.1	5672	64.7
2010	3480.5	490	81.8	71.4	81.1	71.0	81.1	71.4	8760	100.0
2011	2270.3	490	52.9	70.9	52.9	70.5	52.9	70.9	5487	62.6
2012	2578.2	490	60.1	70.6	59.9	70.2	59.9	70.6	6624	75.4
2013	3648.9	490	85.0	71.0	85.0	70.6	85.0	70.9	8693	99.2
2014	1643.6	490	38.3	70.2	38.3	69.8	38.3	70.1	4355	49.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2005			548	
C. Inspection, maintenance or repair combined with refuelling	2400			149	7	
D. Inspection, maintenance or repair without refuelling				817		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				82		
H. Nuclear regulatory requirements					7	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					3	
R. External restrictions on supply and services (lack of funds due to delayed payments from customers, disputes in fuel industries, fuel-rationing, labour strike outside the plant , spare part delivery problems etc.)						13
Z. Other					0	
Subtotal	2400	2005	0	1048	565	15
Total		4405			1628	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	1760	91
12. Reactor I&C Systems		27
13. Reactor Auxiliary Systems		0
14. Safety Systems		3
15. Reactor Cooling Systems		19
16. Steam generation systems		154
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		97
31. Turbine and auxiliaries		106
32. Feedwater and Main Steam System	245	36
33. Circulating Water System		0

41. Main Generator Systems		0
42. Electrical Power Supply Systems		8
Total	2005	542

**US-313 ANO-1****Operator:** ENTERGY (Entergy Nuclear Operations, Inc.)**Contractor:** B&W (BABCOCK & WILCOX CO.)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 836.0 MW(e)

**Design Net Capacity:** 850.0 MW(e)

**Design Discharge Burnup:** 35000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 7180.5 GW(e)·h

**Energy Availability Factor:** 100.0%

**Load Factor:** 98.0%

**Operating Factor:** 100.0%

**Energy Unavailability Factor:** 0.0%

**Total Off-line Time:** 0 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	637.5	576.2	635.7	572.6	445.9	584.8	626.1	623.2	605.2	630.9	615.3	627.3	7180.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>LF (%)</b>	102.5	102.6	102.3	95.1	71.7	97.1	100.7	100.2	100.5	101.4	102.1	100.9	98.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 01 Oct 1968 **Lifetime Generation:** 225117.5 GW(e)·h

**Date of First Criticality:** 06 Aug 1974 **Cumulative Energy Availability Factor:** 80.5%

**Date of Grid Connection:** 17 Aug 1974 **Cumulative Load Factor:** 76.7%

**Date of Commercial Operation:** 19 Dec 1974 **Cumulative Unit Capability Factor:** 80.8%

**Cumulative Energy Unavailability Factor:** 19.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974			Data not provided							
1975	4898.4	797	67.7	67.7	67.7	67.7	70.2	70.2	6661	76.0
1976	3888.0	836	53.0	60.2	53.0	60.2	52.9	61.3	4966	56.5
1977	5103.1	836	69.7	63.4	69.7	63.4	69.7	64.2	6688	76.3
1978	5249.8	836	71.7	65.5	71.7	65.5	71.7	66.1	6676	76.2
1979	3323.4	836	45.4	61.4	45.4	61.4	45.4	61.9	4253	48.6
1980	3781.2	836	74.8	63.7	63.7	61.8	51.5	60.1	5570	63.4
1981	4900.8	836	72.5	65.0	72.5	63.4	66.9	61.1	6336	72.3
1982	3721.4	836	64.8	64.9	64.8	63.5	50.8	59.8	5671	64.7
1983	3220.6	836	48.3	63.1	48.3	61.8	44.0	58.1	4191	47.8
1984	4604.1	836	70.1	63.8	70.1	62.7	62.7	58.5	6150	70.0
1985	5190.4	836	78.3	65.1	78.3	64.1	70.9	59.6	6852	78.2
1986	3589.9	836	62.2	64.9	62.2	63.9	49.0	58.8	5446	62.2
1987	4763.3	836	88.2	66.7	88.2	65.8	65.0	59.2	7720	88.1
1988	3963.2	836	68.3	66.8	68.3	66.0	54.0	58.9	5996	68.3
1989	3377.0	836	67.1	66.8	67.1	66.0	46.1	58.0	5871	67.0
1990	4145.8	836	75.9	67.4	75.9	66.7	56.6	57.9	6437	73.5
1991	6540.5	836	91.3	68.8	91.3	68.1	89.3	59.8	7991	91.2
1992	5833.1	836	80.7	69.4	80.7	68.8	79.4	60.9	7088	80.7
1993	6126.5	836	85.9	70.3	85.9	69.7	83.7	62.1	7520	85.8
1994	7198.6	836	98.7	71.7	98.7	71.2	98.3	63.9	8643	98.7
1995	5978.2	836	85.6	72.4	85.6	71.9	81.6	64.7	7493	85.5
1996	6287.0	836	86.7	73.0	86.7	72.5	85.6	65.7	7613	86.7
1997	7251.1	836	99.6	74.2	99.6	73.7	99.0	67.1	8723	99.6



1998	6216.8	836	84.1	74.6	84.1	74.1	84.9	67.9	7364	84.1
1999	6714.7	836	90.3	75.2	90.3	74.8	91.7	68.8	7907	90.3
2000	6410.1	836	88.2	75.7	88.2	75.3	87.3	69.5	7748	88.2
2001	6875.5	836	91.8	76.3	91.8	75.9	93.9	70.4	8100	92.5
2002	6568.6	836	89.1	76.8	89.1	76.4	89.7	71.1	7820	89.3
2003	6794.3	836	91.8	77.3	91.8	76.9	92.8	71.9	8050	91.9
2004	6827.6	836	91.6	77.8	91.6	77.4	93.0	72.6	8045	91.6
2005	5743.2	840	77.4	77.8	77.4	77.4	78.1	72.8	6778	77.4
2006	7474.9	836	100.0	78.5	100.0	78.1	102.1	73.7	8760	100.0
2007	6882.8	843	92.8	78.9	92.8	78.6	93.2	74.3	8122	92.7
2008	6124.0	843	86.1	79.1	86.1	78.8	82.7	74.5	7558	86.0
2009	7302.1	842	98.1	79.7	98.1	79.3	99.0	75.2	8595	98.1
2010	6607.1	842	90.0	80.0	90.0	79.6	89.6	75.6	7883	90.0
2011	6395.5	842	89.9	80.2	89.9	79.9	86.7	75.9	7872	89.9
2012	7436.1	842	100.0	80.7	100.0	80.5	100.5	76.6	8784	100.0
2013	4448.7	836	61.8	80.3	61.8	80.0	60.7	76.2	5415	61.8
2014	7180.5	836	100.0	80.8	100.0	80.5	98.0	76.7	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					528	
C. Inspection, maintenance or repair combined with refuelling				837		
D. Inspection, maintenance or repair without refuelling				118		
E. Testing of plant systems or components				2	2	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				47		
H. Nuclear regulatory requirements					41	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					5	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
P. Fire					3	
Z. Other				47	1	
Subtotal	0	0	0	1051	580	4
Total	0			1635		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		73
12. Reactor I&C Systems		32
13. Reactor Auxiliary Systems		12
14. Safety Systems		23
15. Reactor Cooling Systems		38
16. Steam generation systems		43
17. Safety I&C Systems (excluding reactor I&C)		17
31. Turbine and auxiliaries		117
32. Feedwater and Main Steam System		58
33. Circulating Water System		8
35. All other I&C Systems		1
41. Main Generator Systems		71
42. Electrical Power Supply Systems		29
XX. Miscellaneous Systems		0
Total	0	522

**US-368 ANO-2****Operator:** ENTERGY (Entergy Nuclear Operations, Inc.)**Contractor:** CE (COMBUSTION ENGINEERING CO.)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 993.0 MW(e)

**Design Net Capacity:** 912.0 MW(e)

**Design Discharge Burnup:** 35000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 7313.9 GW(e)·h

**Energy Availability Factor:** 88.4%

**Load Factor:** 84.1%

**Operating Factor:** 84.3%

**Energy Unavailability Factor:** 11.6%

**Total Off-line Time:** 1378 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	491.9	678.3	749.1	591.0	0.0	413.1	739.9	736.6	715.9	745.3	726.2	726.6	7313.9
<b>EAF (%)</b>	68.5	100.0	100.0	100.0	32.3	61.3	100.0	100.0	100.0	100.0	100.0	100.0	88.4
<b>UCF (%)</b>	68.5	100.0	100.0	100.0	32.3	61.3	100.0	100.0	100.0	100.0	100.0	100.0	88.4
<b>LF (%)</b>	66.6	101.7	101.5	82.7	0.0	57.8	100.1	99.7	100.1	100.9	101.4	98.4	84.1
<b>OF (%)</b>	68.4	100.0	100.0	83.3	0.0	61.3	100.0	100.0	100.0	100.0	100.0	100.0	84.3
<b>EUf (%)</b>	31.5	0.0	0.0	0.0	67.7	38.7	0.0	0.0	0.0	0.0	0.0	0.0	11.6
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	67.7	38.7	0.0	0.0	0.0	0.0	0.0	0.0	8.9
<b>UCLF (%)</b>	31.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 06 Dec 1968      **Lifetime Generation:** 233117.1 GW(e)·h

**Date of First Criticality:** 05 Dec 1978      **Cumulative Energy Availability Factor:** 84.5%

**Date of Grid Connection:** 26 Dec 1978      **Cumulative Load Factor:** 84.5%

**Date of Commercial Operation:** 26 Mar 1980      **Cumulative Unit Capability Factor:** 84.7%

**Cumulative Energy Unavailability Factor:** 15.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	3646.6	884	80.2	80.2	73.5	73.5	60.8	60.8	4913	72.8
1981	4323.6	858	65.2	71.9	65.2	68.9	57.5	59.0	5622	64.2
1982	3807.5	858	57.9	66.9	57.9	65.0	50.7	56.0	5023	57.3
1983	4427.9	858	61.5	65.5	61.5	64.0	58.9	56.8	5380	61.4
1984	6203.6	858	84.7	69.5	84.7	68.4	82.3	62.1	7439	84.7
1985	4701.2	858	69.2	69.4	69.0	68.5	62.5	62.2	6040	68.9
1986	5314.3	858	71.6	69.8	71.6	68.9	70.7	63.4	6274	71.6
1987	6605.2	858	87.7	72.1	87.7	71.3	87.9	66.6	7678	87.6
1988	4952.9	858	66.8	71.5	66.8	70.8	65.7	66.5	5867	66.8
1989	5472.2	858	74.4	71.8	74.4	71.2	72.8	67.1	6514	74.4
1990	7129.6	858	93.8	73.8	93.8	73.3	94.9	69.7	8211	93.7
1991	6123.3	858	82.1	74.5	82.1	74.0	81.5	70.7	7187	82.0
1992	5504.8	858	72.8	74.4	72.8	73.9	73.0	70.9	6390	72.7
1993	7344.7	858	95.3	75.9	95.3	75.5	97.7	72.8	8346	95.3
1994	6724.9	858	88.0	76.7	88.0	76.3	89.5	73.9	7707	88.0
1995	5694.5	858	75.9	76.6	75.9	76.3	75.8	74.1	6644	75.8
1996	7063.9	858	91.6	77.5	91.6	77.2	93.7	75.2	8049	91.6
1997	6957.0	858	91.5	78.3	91.5	78.0	92.6	76.2	8013	91.5
1998	6877.3	858	91.3	79.0	91.3	78.7	91.5	77.0	7995	91.3
1999	6226.9	858	82.4	79.2	82.4	78.9	82.8	77.3	7219	82.4
2000	5265.3	858	69.2	78.7	69.2	78.4	69.9	76.9	6077	69.2
2001	7917.0	858	96.8	79.5	96.8	79.3	105.3	78.2	8498	97.0
2002	8002.2	858	93.1	80.1	93.1	79.9	106.5	79.5	8203	93.6
2003	7925.7	858	92.5	80.6	92.5	80.4	105.5	80.6	8156	93.1

2004	8627.6	1000	97.7	81.4	97.7	81.2	98.2	81.4	8580	97.7
2005	7959.5	1000	90.9	81.9	90.9	81.7	90.9	81.8	7966	90.9
2006	7765.4	998	89.0	82.2	89.0	82.0	88.8	82.1	7793	89.0
2007	8603.3	995	98.0	82.8	98.0	82.6	98.7	82.8	8584	98.0
2008	8060.4	995	93.0	83.2	93.0	83.0	92.2	83.2	8166	93.0
2009	7867.9	997	91.2	83.5	91.2	83.3	90.1	83.4	7986	91.2
2010	8415.6	993	96.7	84.0	96.7	83.8	96.7	83.9	8472	96.7
2011	7812.6	993	90.7	84.2	90.7	84.1	89.8	84.1	7944	90.7
2012	8063.6	993	92.1	84.5	92.1	84.3	92.4	84.4	8090	92.1
2013	7522.8	992	86.0	84.5	86.0	84.4	86.6	84.5	7537	86.0
2014	7313.9	993	88.4	84.7	88.4	84.5	84.1	84.5	7382	84.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1979 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					444	
C. Inspection, maintenance or repair combined with refuelling	770			808		
D. Inspection, maintenance or repair without refuelling				112		
E. Testing of plant systems or components	12			11	20	
H. Nuclear regulatory requirements					26	
J. Grid limitation, failure or grid unavailability			360			13
L. Human factor related					11	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
P. Fire		234			15	
Z. Other					1	
Subtotal	782	234	360	931	517	13
Total		1376			1461	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1979 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		58
13. Reactor Auxiliary Systems		17
14. Safety Systems		78
15. Reactor Cooling Systems		128
16. Steam generation systems		32
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		41
32. Feedwater and Main Steam System		41
33. Circulating Water System		2
41. Main Generator Systems		8
42. Electrical Power Supply Systems		26
XX. Miscellaneous Systems		1
Total	0	437

# US-334 BEAVER VALLEY-1

Operator: FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 921.0 MW(e)  
 Design Net Capacity: 835.0 MW(e)  
 Design Discharge Burnup: 43727 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 7477.4 GW(e)·h  
 Energy Availability Factor: 92.6%  
 Load Factor: 92.7%  
 Operating Factor: 92.6%  
 Energy Unavailability Factor: 7.4%  
 Total Off-line Time: 644 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	149.8	615.7	701.7	673.6	689.4	661.1	682.5	682.8	665.3	576.1	678.3	701.1	7477.4
EAF (%)	25.5	97.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.1	100.0	100.0	92.6
UCF (%)	25.5	97.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.1	100.0	100.0	92.6
LF (%)	21.9	99.5	102.5	101.6	100.6	99.7	99.6	99.7	100.3	84.1	102.2	102.3	92.7
OF (%)	25.5	97.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.1	100.0	100.0	92.6
EUf (%)	74.5	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	0.0	0.0	7.4
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	0.0	0.0	0.8
UCLF (%)	74.5	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 26 Jun 1970      Lifetime Generation: 203516.3 GW(e)·h  
 Date of First Criticality: 10 May 1976      Cumulative Energy Availability Factor: 75.8%  
 Date of Grid Connection: 14 Jun 1976      Cumulative Load Factor: 72.9%  
 Date of Commercial Operation: 01 Oct 1976      Cumulative Unit Capability Factor: 75.8%  
    Cumulative Energy Unavailability Factor: 24.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1976	303.2	834	100.0	100.0	100.0	100.0	16.1	16.1	821	37.2
1977	2870.3	843	39.2	51.6	39.2	51.6	38.9	34.2	4312	49.2
1978	2481.4	800	35.4	44.6	35.4	44.6	35.4	34.7	3569	40.7
1979	1778.4	815	24.8	38.6	24.8	38.6	24.9	31.7	3498	39.9
1980	300.7	811	6.9	31.2	6.9	31.2	4.2	25.3	600	6.8
1981	4674.7	810	73.9	39.2	73.9	39.2	65.9	33.0	6444	73.6
1982	2717.4	810	41.7	39.6	41.7	39.6	38.3	33.8	3644	41.6
1983	4682.2	810	68.5	43.6	68.5	43.6	66.0	38.2	5976	68.2
1984	4756.8	810	71.8	47.0	71.8	47.0	66.9	41.7	6301	71.7
1985	5901.5	810	91.9	51.8	91.9	51.8	83.2	46.1	8046	91.8
1986	4784.2	810	70.7	53.7	70.7	53.7	67.4	48.2	6195	70.7
1987	5620.9	810	84.0	56.3	84.0	56.3	79.2	50.9	7320	83.6
1988	4993.6	810	79.6	58.2	79.6	58.2	70.2	52.5	6989	79.6
1989	3794.3	810	66.5	58.9	66.5	58.9	53.5	52.6	5822	66.5
1990	6167.1	810	92.2	61.2	92.2	61.2	86.9	55.0	8074	92.2
1991	3710.9	810	55.8	60.8	55.8	60.8	52.3	54.8	4883	55.7
1992	6298.4	810	93.6	62.9	93.6	62.9	88.5	56.9	8218	93.6
1993	4359.8	810	67.3	63.1	67.3	63.1	61.4	57.1	5891	67.2
1994	5504.4	810	79.9	64.0	79.9	64.0	77.6	58.3	6991	79.8
1995	5449.2	810	77.8	64.7	77.8	64.7	76.8	59.2	6813	77.8
1996	5698.1	810	81.3	65.6	81.3	65.6	80.1	60.3	7132	81.2
1997	4025.8	810	56.8	65.1	56.8	65.1	56.7	60.1	4972	56.8
1998	2829.3	810	40.4	64.0	40.4	64.0	39.9	59.2	3557	40.6
1999	6106.2	810	88.5	65.1	88.5	65.1	86.1	60.3	7746	88.4

2000	5883.0	810	84.6	65.9	84.6	65.9	82.7	61.3	7430	84.6
2001	5991.0	821	84.6	66.6	84.6	66.6	84.1	62.2	7407	84.6
2002	6989.9	821	97.0	67.8	97.0	67.8	97.2	63.5	8490	96.9
2003	5985.4	821	84.1	68.4	84.1	68.4	83.2	64.2	7359	84.0
2004	6678.5	821	92.4	69.3	92.4	69.3	92.6	65.3	8119	92.4
2005	7290.3	821	100.0	70.3	100.0	70.3	101.4	66.5	8760	100.0
2006	5828.6	851	79.6	70.6	79.6	70.6	78.2	66.9	6973	79.6
2007	7057.7	892	91.6	71.4	91.6	71.4	90.3	67.7	8017	91.5
2008	7945.0	892	100.0	72.3	100.0	72.3	101.4	68.9	8784	100.0
2009	7217.5	892	91.3	73.0	91.3	73.0	92.4	69.6	7999	91.3
2010	7119.4	892	90.9	73.5	90.9	73.5	91.1	70.3	7963	90.9
2011	7854.6	892	99.3	74.3	99.3	74.3	100.5	71.2	8702	99.3
2012	7220.6	892	91.2	74.8	91.2	74.8	92.2	71.9	8010	91.2
2013	6963.1	921	89.4	75.2	89.4	75.2	88.9	72.4	7825	89.3
2014	7477.4	921	92.6	75.8	92.6	75.8	92.7	72.9	8116	92.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1976 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		570			570	
C. Inspection, maintenance or repair combined with refuelling				1074	4	
D. Inspection, maintenance or repair without refuelling	73			93		
E. Testing of plant systems or components				8	17	
H. Nuclear regulatory requirements					99	
L. Human factor related					12	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Z. Other				17	158	
Subtotal	73	570	0	1192	860	2
Total		643			2054	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1976 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		37
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		28
14. Safety Systems		16
15. Reactor Cooling Systems		142
16. Steam generation systems		1
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		118
35. All other I&C Systems		0
41. Main Generator Systems		18
42. Electrical Power Supply Systems	570	126
XX. Miscellaneous Systems		49
Total	570	564

## US-412 BEAVER VALLEY-2

Operator: FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 904.0 MW(e)

Design Net Capacity: 836.0 MW(e)

Design Discharge Burnup: 36351 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7279.9 GW(e)·h

Energy Availability Factor: 90.7%

Load Factor: 91.9%

Operating Factor: 90.5%

Energy Unavailability Factor: 9.3%

Total Off-line Time: 831 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	695.1	627.4	693.7	374.3	155.3	660.4	682.0	682.0	663.6	676.3	672.9	696.9	7279.9
EAF (%)	100.0	100.0	100.0	60.8	28.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.7
UCF (%)	100.0	100.0	100.0	60.8	28.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.7
LF (%)	103.3	103.3	103.3	57.5	23.1	101.5	101.4	101.4	102.0	100.5	103.2	103.6	91.9
OF (%)	100.0	100.0	100.0	60.0	27.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.5
EUf (%)	0.0	0.0	0.0	39.2	71.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3
PUf (%)	0.0	0.0	0.0	39.2	71.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 03 May 1974      Lifetime Generation: 169733.6 GW(e)·h

Date of First Criticality: 04 Aug 1987      Cumulative Energy Availability Factor: 87.5%

Date of Grid Connection: 17 Aug 1987      Cumulative Load Factor: 84.9%

Date of Commercial Operation: 17 Nov 1987      Cumulative Unit Capability Factor: 87.5%

   Cumulative Energy Unavailability Factor: 12.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	738.1	822	100.0	100.0	100.0	100.0	82.4	82.4	950	88.7
1988	6477.1	833	93.8	94.5	93.8	94.5	88.5	87.9	8224	93.6
1989	4557.1	833	71.7	83.7	71.7	83.7	62.5	75.9	6245	71.3
1990	4291.6	827	77.1	81.6	77.1	81.6	59.2	70.6	6734	76.9
1991	6762.2	820	99.5	85.9	99.5	85.9	94.1	76.2	8720	99.5
1992	5647.1	820	94.8	87.7	94.8	87.7	78.4	76.7	7342	83.6
1993	5212.7	820	77.3	86.0	77.3	86.0	72.6	76.0	6770	77.3
1994	7024.7	820	96.8	87.5	96.8	87.5	97.8	79.0	8481	96.8
1995	6047.0	820	87.0	87.4	87.0	87.4	84.2	79.7	7616	86.9
1996	4788.6	820	70.3	85.6	70.3	85.6	66.5	78.2	6169	70.2
1997	6158.7	820	86.6	85.7	86.6	85.7	85.7	79.0	7583	86.6
1998	1808.7	820	25.1	80.2	25.1	80.2	25.2	74.1	2179	24.9
1999	5752.5	820	81.7	80.4	81.7	80.4	80.1	74.6	7155	81.7
2000	6227.8	820	88.9	81.0	88.9	81.0	86.5	75.5	7804	88.8
2001	7191.7	831	99.4	82.3	99.4	82.3	99.8	77.3	8702	99.3
2002	6604.3	831	92.9	83.0	92.9	83.0	90.7	78.1	8133	92.8
2003	6637.0	831	91.8	83.6	91.8	83.6	91.2	79.0	8037	91.7
2004	7314.8	831	100.0	84.5	100.0	84.5	100.2	80.2	8784	100.0
2005	6680.0	831	93.3	85.0	93.3	85.0	91.8	80.9	8169	93.3
2006	6309.5	851	87.6	85.2	87.6	85.2	84.6	81.1	7673	87.6
2007	7473.2	846	100.0	85.9	100.0	85.9	100.8	82.1	8760	100.0
2008	6726.2	890	87.9	86.0	87.9	86.0	87.8	82.4	7744	88.2
2009	6194.0	846	86.7	86.0	86.7	86.0	83.6	82.4	7651	87.3
2010	7874.2	885	100.0	86.7	100.0	86.7	101.6	83.3	8760	100.0

2011	7085.8	885	90.4	86.8	90.4	86.8	91.4	83.6	7920	90.4
2012	7032.5	885	89.1	86.9	89.1	86.9	90.5	83.9	7828	89.1
2013	7818.6	885	96.6	87.3	96.6	87.3	100.8	84.6	8458	96.5
2014	7279.9	904	90.7	87.5	90.7	87.5	91.9	84.9	7929	90.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					374	
C. Inspection, maintenance or repair combined with refuelling	830			618	2	
D. Inspection, maintenance or repair without refuelling				14		
E. Testing of plant systems or components				0	15	
L. Human factor related					5	
Z. Other					51	
Subtotal	830	0	0	632	447	0
Total	830			1079		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		32
14. Safety Systems		14
15. Reactor Cooling Systems		205
16. Steam generation systems		20
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		7
35. All other I&C Systems		3
41. Main Generator Systems		17
42. Electrical Power Supply Systems		23
XX. Miscellaneous Systems		8
Total	0	368

# US-456 BRAIDWOOD-1

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1194.0 MW(e)  
 Design Net Capacity: 1120.0 MW(e)  
 Design Discharge Burnup: 49000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 10599.6 GW(e)·h  
 Energy Availability Factor: 100.0%  
 Load Factor: 101.3%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.0%  
 Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	893.5	814.3	907.8	877.2	903.2	864.7	892.2	889.4	867.8	904.1	877.6	907.8	10599.6
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	100.6	101.5	102.3	102.0	101.7	100.6	100.4	100.1	101.0	101.8	101.9	102.2	101.3
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Aug 1975      Lifetime Generation: 233948.6 GW(e)·h  
 Date of First Criticality: 29 May 1987      Cumulative Energy Availability Factor: 89.2%  
 Date of Grid Connection: 12 Jul 1987      Cumulative Load Factor: 87.8%  
 Date of Commercial Operation: 29 Jul 1988      Cumulative Unit Capability Factor: 89.2%  
    Cumulative Energy Unavailability Factor: 10.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	3424.2	1105	91.7	91.7	91.7	91.7	82.0	82.0	3409	91.4
1989	4649.1	1120	62.3	71.0	62.3	71.0	47.4	57.7	5435	62.0
1990	8264.6	1120	89.1	78.5	89.1	78.5	84.2	68.6	7778	88.8
1991	5018.6	1120	59.4	72.9	59.4	72.9	51.2	63.5	5198	59.3
1992	7157.9	1120	81.4	74.8	81.4	74.8	72.8	65.6	7142	81.3
1993	8693.1	1120	92.1	78.0	92.1	78.0	88.6	69.9	8048	91.9
1994	7398.2	1120	79.8	78.3	79.8	78.3	75.4	70.7	6940	79.2
1995	6614.3	1120	71.7	77.4	71.7	77.4	67.4	70.3	6214	70.9
1996	7618.9	1120	80.5	77.8	80.5	77.8	77.4	71.1	7021	79.9
1997	8096.3	1120	84.0	78.4	84.0	78.4	82.5	72.3	7339	83.8
1998	7578.8	1118	79.9	78.6	79.9	78.6	77.4	72.8	6976	79.6
1999	9904.8	1120	99.1	80.4	99.1	80.4	101.0	75.3	8680	99.1
2000	9311.3	1103	94.9	81.5	94.9	81.5	96.1	76.9	8335	94.9
2001	9557.9	1168	94.0	82.5	94.0	82.5	97.7	78.5	8247	94.1
2002	10612.2	1161	100.0	83.7	100.0	83.7	104.1	80.3	8760	100.0
2003	10094.8	1161	95.3	84.5	95.3	84.5	99.3	81.6	8353	95.4
2004	9807.2	1161	94.5	85.1	94.5	85.1	96.2	82.5	8310	94.6
2005	10277.0	1185	98.5	85.9	98.5	85.9	99.0	83.5	8630	98.5
2006	9945.9	1178	95.4	86.5	95.4	86.5	96.4	84.2	8352	95.3
2007	9526.7	1178	93.1	86.8	92.7	86.8	92.3	84.7	8119	92.7
2008	10462.9	1178	100.0	87.5	100.0	87.5	101.1	85.5	8784	100.0
2009	9826.3	1178	94.3	87.8	94.3	87.8	95.2	86.0	8259	94.3
2010	9196.7	1178	89.1	87.9	89.1	87.9	89.1	86.1	7806	89.1
2011	10411.7	1178	100.0	88.4	100.0	88.4	100.9	86.8	8760	100.0



2012	9388.4	1178	90.7	88.5	90.7	88.5	90.7	86.9	7969	90.7
2013	9754.6	1178	94.0	88.7	94.0	88.7	94.5	87.2	8238	94.0
2014	10599.6	1194	100.0	89.2	100.0	89.2	101.3	87.8	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					231	
C. Inspection, maintenance or repair combined with refuelling				593		
D. Inspection, maintenance or repair without refuelling				96		
E. Testing of plant systems or components				1		
H. Nuclear regulatory requirements					16	
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other				0	2	
Subtotal	0	0	0	690	255	4
Total	0			949		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		3
14. Safety Systems		3
15. Reactor Cooling Systems		6
16. Steam generation systems		17
17. Safety I&C Systems (excluding reactor I&C)		26
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		18
41. Main Generator Systems		124
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems		15
Total	0	225

# US-457 BRAIDWOOD-2

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1160.0 MW(e)  
 Design Net Capacity: 1120.0 MW(e)  
 Design Discharge Burnup: 49000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9670.5 GW(e)·h  
 Energy Availability Factor: 94.5%  
 Load Factor: 95.2%  
 Operating Factor: 94.5%  
 Energy Unavailability Factor: 5.5%  
 Total Off-line Time: 484 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	868.6	790.4	880.0	849.8	254.7	839.4	866.0	863.5	843.1	879.6	852.6	882.7	9670.5
EAF (%)	100.0	100.0	100.0	100.0	35.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.5
UCF (%)	100.0	100.0	100.0	100.0	35.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.5
LF (%)	100.6	101.4	102.1	101.7	29.5	100.5	100.3	100.1	100.9	101.9	101.9	102.3	95.2
OF (%)	100.0	100.0	100.0	100.0	34.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.5
EUf (%)	0.0	0.0	0.0	0.0	64.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5
PUf (%)	0.0	0.0	0.0	0.0	63.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4
UCLF (%)	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Aug 1975      Lifetime Generation: 233749.1 GW(e)·h  
 Date of First Criticality: 08 Mar 1988      Cumulative Energy Availability Factor: 91.5%  
 Date of Grid Connection: 25 May 1988      Cumulative Load Factor: 89.6%  
 Date of Commercial Operation: 17 Oct 1988      Cumulative Unit Capability Factor: 91.5%  
    Cumulative Energy Unavailability Factor: 8.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	1350.9	1097	81.9	81.9	81.9	81.9	66.6	66.6	1476	81.5
1989	7142.0	1120	86.9	86.0	86.9	86.0	72.8	71.7	7581	86.5
1990	6353.6	1120	78.8	82.8	78.8	82.8	64.8	68.6	6849	78.2
1991	6545.5	1120	75.7	80.6	75.7	80.6	66.7	68.0	6626	75.6
1992	8751.1	1120	95.1	84.0	95.1	84.0	89.0	73.0	8346	95.0
1993	7362.3	1120	81.5	83.5	81.5	83.5	75.0	73.4	7098	81.0
1994	6636.1	1120	74.1	82.0	74.1	82.0	67.6	72.5	6454	73.7
1995	9533.0	1120	98.1	84.2	98.1	84.2	97.2	75.9	8583	98.0
1996	8011.8	1120	84.1	84.2	84.1	84.2	81.4	76.6	7349	83.7
1997	8234.7	1120	86.5	84.5	86.5	84.5	83.9	77.4	7563	86.3
1998	9694.6	1118	97.7	85.8	97.7	85.8	99.0	79.5	8552	97.6
1999	9030.9	1120	92.3	86.3	92.3	86.3	92.0	80.6	8070	92.1
2000	9510.9	1103	94.6	87.0	94.6	87.0	98.1	82.0	8303	94.5
2001	9647.9	1122	96.7	87.7	96.7	87.7	99.0	83.3	8481	96.8
2002	9449.5	1154	92.5	88.1	92.5	88.1	94.3	84.1	8099	92.5
2003	9932.2	1154	95.1	88.6	95.1	88.6	98.3	85.0	8337	95.2
2004	10201.0	1129	99.7	89.3	99.7	89.3	102.7	86.1	8757	99.7
2005	9519.4	1177	94.1	89.5	94.1	89.5	92.3	86.5	8244	94.1
2006	9624.6	1152	95.2	89.9	95.2	89.9	95.4	87.0	8335	95.1
2007	10131.2	1152	100.0	90.4	99.4	90.4	100.4	87.7	8706	99.4
2008	9323.2	1152	92.3	90.5	92.3	90.5	92.1	87.9	8106	92.3
2009	9401.7	1152	92.7	90.6	92.7	90.6	93.2	88.2	8121	92.7
2010	10003.2	1152	98.2	91.0	98.2	90.9	99.1	88.7	8599	98.2
2011	9364.2	1152	93.4	91.1	93.4	91.0	92.8	88.9	8177	93.3

2012	9417.9	1152	93.2	91.1	93.2	91.1	93.1	89.1	8188	93.2
2013	9905.0	1152	97.9	91.4	97.9	91.4	98.1	89.4	8580	97.9
2014	9670.5	1160	94.5	91.5	94.5	91.5	95.2	89.6	8276	94.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		4			122	
C. Inspection, maintenance or repair combined with refuelling	478			503		
D. Inspection, maintenance or repair without refuelling				66		
L. Human factor related					10	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
Z. Other					10	
Subtotal	478	4	0	569	142	3
Total		482			714	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		11
14. Safety Systems		7
15. Reactor Cooling Systems		7
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		13
35. All other I&C Systems		4
41. Main Generator Systems	4	15
42. Electrical Power Supply Systems		48
XX. Miscellaneous Systems		1
Total	4	117

## 1. Station Details

## 2. Production Summary 2014

### 3. 2014 Monthly Performance Data

**UCLF replaces previously used UUF.**

#### 4. 2014 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1967	<b>Lifetime Generation:</b>	121519.0 GW(e)-h
<b>Date of First Criticality:</b>	17 Aug 1973	<b>Cumulative Energy Availability Factor:</b>	71.5%
<b>Date of Grid Connection:</b>	15 Oct 1973	<b>Cumulative Load Factor:</b>	69.2%
<b>Date of Commercial Operation:</b>	01 Aug 1974	<b>Cumulative Unit Capability Factor:</b>	71.9%
		<b>Cumulative Energy Unavailability Factor:</b>	28.5%

[illegible]

1998											"
1999											"
2000											"
2001											"
2002											"
2003											"
2004											"
2005											"
2006											"
2007	4535.3	1065	85.4	58.9	85.4	58.9	82.9	55.5	4452	86.7	
2008	8193.1	1065	87.6	61.2	87.6	61.2	87.6	58.1	7693	87.6	
2009	8758.7	1065	93.0	63.6	93.0	63.6	93.9	60.8	8147	93.0	
2010	8072.3	1093	91.5	65.6	91.5	65.6	86.1	62.6	8007	91.4	
2011	8757.4	1101	98.2	67.8	92.0	67.4	90.8	64.5	8048	91.9	
2012	8506.0	1101	87.6	69.0	87.6	68.6	88.0	66.0	7691	87.6	
2013	9486.0	1101	97.2	70.7	97.2	70.3	98.3	67.9	8516	97.2	
2014	8691.4	1101	91.6	71.9	91.6	71.5	90.1	69.2	8021	91.6	

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1973 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		115			145	
C. Inspection, maintenance or repair combined with refuelling	623			457		
D. Inspection, maintenance or repair without refuelling				49		
E. Testing of plant systems or components				0	10	
J. Grid limitation, failure or grid unavailability						13
L. Human factor related					5	
P. Fire					314	
Z. Other					1	
Subtotal	623	115	0	506	475	13
Total		738			994	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1973 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		8
14. Safety Systems		10
15. Reactor Cooling Systems		42
31. Turbine and auxiliaries		31
32. Feedwater and Main Steam System		15
41. Main Generator Systems	115	2
42. Electrical Power Supply Systems		16
XX. Miscellaneous Systems		8
Total	115	139

# US-260 BROWNS FERRY-2

Operator: TVA (Tennessee Valley Authority)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1104.0 MW(e)  
 Design Net Capacity: 1065.0 MW(e)  
 Design Discharge Burnup: 38000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9481.4 GW(e)·h  
 Energy Availability Factor: 98.8%  
 Load Factor: 98.0%  
 Operating Factor: 98.8%  
 Energy Unavailability Factor: 1.2%  
 Total Off-line Time: 103 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	829.3	763.8	836.6	803.3	800.6	747.9	803.3	647.5	773.6	823.6	811.5	840.4	9481.4
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	86.2	100.0	100.0	100.0	100.0	98.8
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	86.2	100.0	100.0	100.0	100.0	98.8
LF (%)	101.0	103.0	102.0	101.1	97.5	94.1	97.8	78.8	97.3	100.3	102.0	102.3	98.0
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	86.2	100.0	100.0	100.0	100.0	98.8
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.8	0.0	0.0	0.0	0.0	1.2
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.8	0.0	0.0	0.0	0.0	1.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 May 1967      Lifetime Generation: 251895.9 GW(e)·h  
 Date of First Criticality: 20 Jul 1974      Cumulative Energy Availability Factor: 80.8%  
 Date of Grid Connection: 28 Aug 1974      Cumulative Load Factor: 77.7%  
 Date of Commercial Operation: 01 Mar 1975      Cumulative Unit Capability Factor: 81.1%  
    Cumulative Energy Unavailability Factor: 19.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	550.6	1065	7.0	7.0	7.0	7.0	7.0	7.0	517	7.0
1976	1567.2	1065	16.8	12.3	16.8	12.3	16.8	12.3	2547	29.0
1977	6225.0	1065	66.8	31.5	66.8	31.5	66.7	31.5	6963	79.5
1978	5547.5	1065	59.5	38.8	59.5	38.8	59.5	38.8	6032	68.9
1979	7441.4	1065	79.8	47.2	79.8	47.2	79.8	47.2	7593	86.7
1980	5618.4	1065	69.8	51.1	69.5	51.1	60.1	49.4	6073	69.1
1981	7471.9	1065	85.2	56.1	85.2	56.1	80.1	53.9	7452	85.1
1982	4450.9	1065	54.9	55.9	54.9	55.9	47.7	53.1	4778	54.5
1983	6385.6	1065	74.8	58.1	74.8	58.0	68.4	54.9	6514	74.4
1984	4044.4	1065	66.5	58.9	66.5	58.9	43.2	53.7	5844	66.5
1985	0.0	1065	0.0	57.5	0.0	57.5	0.0	52.4	0	0.0
1986	Data not available - Long-term shutdown									
1987	"									
1988	"									
1989	"									
1990	"									
1991	3804.0	1065	70.2	58.3	70.2	58.3	60.7	52.9	4125	70.1
1992	8388.8	1065	95.7	61.5	95.7	61.5	89.7	56.0	8401	95.6
1993	5776.8	1065	65.7	61.8	65.7	61.8	61.9	56.5	5753	65.7
1994	7345.2	1065	82.6	63.3	82.6	63.3	78.7	58.1	7234	82.6
1995	9197.0	1065	98.5	65.7	98.5	65.7	98.6	60.8	8629	98.5
1996	8046.3	1065	88.7	67.2	88.7	67.1	86.0	62.4	7795	88.7
1997	8372.9	1065	92.8	68.7	92.8	68.7	89.7	64.1	8130	92.8
1998	9301.0	1065	99.7	70.4	99.7	70.4	99.7	66.1	8730	99.7

1999	8586.3	1100	91.0	71.6	91.0	71.6	89.1	67.3	7985	91.2
2000	9733.5	1118	99.4	73.0	99.4	73.0	99.1	69.0	8727	99.4
2001	8414.6	1118	87.2	73.8	87.2	73.7	85.9	69.9	7636	87.2
2002	8911.3	1118	94.4	74.7	94.4	74.7	91.0	70.9	8269	94.4
2003	8369.2	1118	90.1	75.4	90.1	75.4	85.5	71.5	7888	90.0
2004	9786.0	1118	99.2	76.5	99.2	76.5	99.6	72.8	8715	99.2
2005	8802.2	1118	91.9	77.1	91.9	77.1	89.9	73.5	8052	91.9
2006	9232.6	1118	95.5	77.9	95.5	77.9	94.3	74.3	8365	95.5
2007	7606.6	1104	80.7	78.0	80.7	78.0	78.7	74.5	7229	82.5
2008	9429.9	1104	97.3	78.7	97.3	78.7	97.2	75.3	8545	97.3
2009	7808.5	1103	81.3	78.8	81.3	78.8	80.8	75.5	7122	81.3
2010	8842.5	1104	97.8	79.4	97.8	79.4	91.4	76.1	8568	97.8
2011	7720.4	1104	88.6	79.7	81.0	79.5	79.8	76.2	7092	81.0
2012	9576.0	1104	98.9	80.3	98.9	80.1	98.7	76.9	8685	98.9
2013	7997.8	1104	85.9	80.5	85.9	80.3	82.7	77.1	7527	85.9
2014	9481.4	1104	98.8	81.1	98.8	80.8	98.0	77.7	8657	98.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					167	
C. Inspection, maintenance or repair combined with refuelling				861		
D. Inspection, maintenance or repair without refuelling	102			69		
E. Testing of plant systems or components				6	2	
J. Grid limitation, failure or grid unavailability						16
L. Human factor related					19	
P. Fire					314	
Z. Other					1	
Subtotal	102	0	0	936	503	16
Total	102			1455		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		27
13. Reactor Auxiliary Systems		10
14. Safety Systems		8
15. Reactor Cooling Systems		24
31. Turbine and auxiliaries		43
32. Feedwater and Main Steam System		8
35. All other I&C Systems		0
41. Main Generator Systems		14
42. Electrical Power Supply Systems		20
XX. Miscellaneous Systems		3
Total	0	161

# US-296 BROWNS FERRY-3

Operator: TVA (Tennessee Valley Authority)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1105.0 MW(e)

Design Net Capacity: 1065.0 MW(e)

Design Discharge Burnup: 38000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8565.5 GW(e)·h

Energy Availability Factor: 90.3%

Load Factor: 88.5%

Operating Factor: 90.3%

Energy Unavailability Factor: 9.7%

Total Off-line Time: 849 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	813.5	324.5	271.7	797.7	725.3	782.4	811.3	806.9	789.6	807.5	800.8	834.4	8565.5
EAF (%)	100.0	49.7	40.3	100.0	90.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3
UCF (%)	100.0	49.7	40.3	100.0	90.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3
LF (%)	98.9	43.7	33.1	100.3	88.2	98.3	98.7	98.1	99.2	98.2	100.5	101.5	88.5
OF (%)	100.0	49.7	40.2	100.0	91.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3
EUf (%)	0.0	50.3	59.7	0.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7
PUf (%)	0.0	50.3	55.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.6
UCLF (%)	0.0	0.0	4.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jul 1968      Lifetime Generation: 212387.3 GW(e)·h

Date of First Criticality: 08 Aug 1976      Cumulative Energy Availability Factor: 82.8%

Date of Grid Connection: 12 Sep 1976      Cumulative Load Factor: 80.4%

Date of Commercial Operation: 01 Mar 1977      Cumulative Unit Capability Factor: 83.2%

   Cumulative Energy Unavailability Factor: 17.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	5850.9	1065	74.8	74.8	74.8	74.8	74.8	74.8	6499	88.5
1978	5554.3	1065	59.5	66.5	59.5	66.5	59.5	66.5	6225	71.1
1979	5482.5	1065	58.8	63.8	58.8	63.8	58.8	63.8	5704	65.1
1980	6936.1	1065	79.9	68.0	79.3	67.8	74.1	66.5	6949	79.1
1981	6264.8	1065	72.6	68.9	72.6	68.8	67.2	66.6	6358	72.6
1982	4892.8	1065	57.4	67.0	57.4	66.9	52.4	64.2	5022	57.3
1983	5394.3	1065	61.9	66.2	61.9	66.1	57.8	63.3	5417	61.8
1984	290.5	1065	5.7	58.5	5.7	58.4	3.1	55.6	503	5.7
1985	1526.5	1065	68.8	58.8	68.8	58.7	66.4	55.9	1496	69.3
1986	Data not available - Long-term shutdown									
1987	"									
1988	"									
1989	"									
1990	"									
1991	"									
1992	"									
1993	"									
1994	"									
1995	764.6	1065	79.5	59.1	79.5	59.0	70.4	56.1	810	79.4
1996	8803.5	1065	95.8	63.1	95.8	63.0	94.1	60.2	8412	95.8
1997	8523.4	1065	94.8	66.2	94.8	66.1	91.4	63.3	8302	94.8
1998	7884.9	1078	89.9	68.3	89.9	68.3	83.5	65.1	7863	89.8
1999	9730.6	1118	100.0	71.0	100.0	71.0	99.4	68.0	8760	100.0
2000	9097.4	1118	94.6	72.9	94.6	72.9	92.6	70.0	8311	94.6



2001	9803.4	1118	100.0	74.9	100.0	74.8	100.1	72.2	8760	100.0
2002	9260.1	1118	96.0	76.3	96.0	76.3	94.6	73.7	8407	96.0
2003	9325.7	1118	96.6	77.6	96.6	77.6	95.2	75.1	8463	96.6
2004	8701.8	1118	91.1	78.4	91.1	78.4	88.6	75.9	8000	91.1
2005	9153.7	1114	96.2	79.4	95.7	79.4	93.8	76.9	8384	95.7
2006	8638.8	1117	91.1	80.1	91.1	80.0	88.3	77.5	7974	91.0
2007	9086.1	1105	95.6	80.8	95.6	80.8	93.9	78.3	8372	95.6
2008	7300.6	1104	76.4	80.6	76.4	80.6	75.3	78.2	6794	77.3
2009	9175.4	1104	95.9	81.3	95.9	81.3	94.9	78.9	8433	96.3
2010	7858.1	1105	87.1	81.6	87.1	81.5	81.2	79.0	7625	87.0
2011	8451.1	1105	97.6	82.2	88.3	81.8	87.3	79.4	7731	88.3
2012	7999.5	1105	84.9	82.3	84.9	81.9	82.4	79.5	7455	84.9
2013	9234.3	1105	96.4	82.9	96.4	82.5	95.4	80.1	8443	96.4
2014	8565.5	1105	90.3	83.2	90.3	82.8	88.5	80.4	7911	90.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		97			192	
C. Inspection, maintenance or repair combined with refuelling	751			504	204	
D. Inspection, maintenance or repair without refuelling				26		
E. Testing of plant systems or components				5	0	
J. Grid limitation, failure or grid unavailability						21
L. Human factor related					7	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				2		
Z. Other					8	
Subtotal	751	97	0	537	411	25
Total		848			973	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems	67	13
13. Reactor Auxiliary Systems		12
14. Safety Systems		13
15. Reactor Cooling Systems		32
31. Turbine and auxiliaries	29	55
32. Feedwater and Main Steam System		22
41. Main Generator Systems		15
42. Electrical Power Supply Systems		20
XX. Miscellaneous Systems		6
Total	96	189

# US-325 BRUNSWICK-1

**Operator:** PROGRESS (Progress Energy)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 938.0 MW(e)  
**Design Net Capacity:** 821.0 MW(e)  
**Design Discharge Burnup:** 27800 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 7347.7 GW(e)·h  
**Energy Availability Factor:** 88.5%  
**Load Factor:** 89.4%  
**Operating Factor:** 88.5%  
**Energy Unavailability Factor:** 11.5%  
**Total Off-line Time:** 1009 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	718.5	628.7	0.0	392.9	709.0	683.4	708.2	705.9	672.9	716.0	699.6	712.6	7347.7
<b>EAF (%)</b>	100.0	99.5	0.0	63.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.5
<b>UCF (%)</b>	100.0	99.5	0.0	63.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.5
<b>LF (%)</b>	103.0	99.7	0.0	58.2	101.6	101.2	101.5	101.2	99.6	102.6	103.4	102.1	89.4
<b>OF (%)</b>	100.0	99.6	0.0	63.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.5
<b>EUf (%)</b>	0.0	0.5	100.0	36.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5
<b>PUf (%)</b>	0.0	0.5	100.0	36.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 07 Feb 1970      **Lifetime Generation:** 206293.4 GW(e)·h  
**Date of First Criticality:** 08 Oct 1976      **Cumulative Energy Availability Factor:** 76.5%  
**Date of Grid Connection:** 04 Dec 1976      **Cumulative Load Factor:** 74.6%  
**Date of Commercial Operation:** 18 Mar 1977      **Cumulative Unit Capability Factor:** 76.7%  
**Cumulative Energy Unavailability Factor:** 23.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	2515.8	790	43.4	43.4	43.4	43.4	43.4	43.4	3920	53.4
1978	5122.9	790	74.1	60.1	74.1	60.1	74.0	60.0	7624	87.0
1979	3169.2	790	45.8	55.1	45.8	55.1	45.8	55.0	4778	54.5
1980	3939.2	790	69.7	58.9	69.7	58.9	56.8	55.5	6045	68.8
1981	2574.8	790	49.0	56.8	49.0	56.8	37.2	51.7	4155	47.4
1982	2935.4	790	62.9	57.9	62.9	57.9	42.4	50.1	5428	62.0
1983	1419.1	790	26.4	53.3	26.4	53.3	20.5	45.8	2116	24.2
1984	5037.7	790	81.4	56.9	79.8	56.7	72.6	49.2	6797	77.4
1985	1942.5	790	38.9	54.9	38.9	54.7	28.1	46.8	3247	37.1
1986	5973.8	790	92.2	58.6	92.2	58.5	86.3	50.8	8068	92.1
1987	4057.9	790	65.6	59.3	65.6	59.1	58.6	51.6	5651	64.5
1988	4458.4	790	74.5	60.6	74.5	60.4	64.2	52.6	6514	74.2
1989	4193.8	790	64.6	60.9	64.6	60.8	60.6	53.2	5568	63.6
1990	4340.3	790	68.4	61.4	68.4	61.3	62.7	53.9	5909	67.5
1991	4400.3	780	67.3	61.8	67.3	61.7	64.4	54.6	5849	66.8
1992	1874.5	767	28.3	59.8	28.3	59.7	27.8	53.0	2486	28.3
1993	0.0	767	0.0	56.3	0.0	56.2	0.0	49.9	0	0.0
1994	5956.3	767	88.6	58.1	88.6	58.0	88.7	52.0	7755	88.5
1995	5780.7	767	84.4	59.4	84.4	59.3	86.0	53.8	7391	84.4
1996	5708.2	767	88.6	60.9	85.3	60.6	84.7	55.3	7490	85.3
1997	6857.0	767	97.7	62.6	97.7	62.4	102.1	57.5	8558	97.7
1998	6360.4	820	91.4	64.0	89.9	63.7	88.5	59.0	7811	89.2
1999	6998.2	820	99.0	65.6	96.8	65.2	97.4	60.8	8481	96.8
2000	6746.5	820	92.5	66.8	92.5	66.4	93.7	62.2	8122	92.5

2001	7303.1	820	100.0	68.1	100.0	67.8	101.7	63.8	8760	100.0
2002	6697.3	820	89.9	69.0	89.9	68.7	93.2	65.0	7874	89.9
2003	7701.8	872	98.9	70.2	98.9	69.9	100.8	66.5	8653	98.8
2004	7093.4	872	90.5	71.0	89.4	70.7	92.6	67.5	7853	89.4
2005	7755.1	872	94.5	71.9	94.5	71.6	101.5	68.8	8275	94.5
2006	7190.8	938	86.8	72.5	86.8	72.2	87.5	69.5	7601	86.8
2007	7881.9	938	94.6	73.3	94.6	73.0	95.9	70.5	8290	94.6
2008	7030.6	938	84.9	73.8	84.9	73.5	85.3	71.1	7458	84.9
2009	8022.7	938	97.0	74.6	97.0	74.3	97.6	72.0	8493	97.0
2010	6810.9	938	82.8	74.9	82.8	74.6	82.9	72.4	7255	82.8
2011	8228.4	938	98.9	75.6	98.9	75.4	100.1	73.3	8663	98.9
2012	6323.9	938	77.2	75.7	77.2	75.4	76.8	73.4	6778	77.2
2013	8074.2	938	96.8	76.3	96.8	76.1	98.3	74.2	8483	96.8
2014	7347.7	938	88.5	76.7	88.5	76.5	89.4	74.6	7751	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					330	
C. Inspection, maintenance or repair combined with refuelling	1009			1163		
D. Inspection, maintenance or repair without refuelling				421		
E. Testing of plant systems or components				5	56	
H. Nuclear regulatory requirements					11	
J. Grid limitation, failure or grid unavailability						3
L. Human factor related					33	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						22
Z. Other					6	
Subtotal	1009	0	0	1589	436	25
Total	1009			2050		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		16
13. Reactor Auxiliary Systems		8
14. Safety Systems		21
15. Reactor Cooling Systems		55
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		12
33. Circulating Water System		5
41. Main Generator Systems		106
42. Electrical Power Supply Systems		42
XX. Miscellaneous Systems		17
Total	0	325

## US-324 BRUNSWICK-2

**Operator:** PROGRESS (Progress Energy)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 920.0 MW(e)  
**Design Net Capacity:** 821.0 MW(e)  
**Design Discharge Burnup:** 27800 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7987.6 GW(e)·h  
**Energy Availability Factor:** 99.5%  
**Load Factor:** 99.1%  
**Operating Factor:** 99.5%  
**Energy Unavailability Factor:** 0.5%  
**Total Off-line Time:** 45 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	694.6	570.3	698.3	639.6	690.4	656.2	682.2	678.3	656.4	670.5	668.3	682.5	7987.6
<b>EAF (%)</b>	100.0	93.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5
<b>UCF (%)</b>	100.0	93.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5
<b>LF (%)</b>	101.5	92.2	102.2	96.6	100.9	99.1	99.7	99.1	99.1	98.0	100.7	99.7	99.1
<b>OF (%)</b>	100.0	93.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5
<b>EUf (%)</b>	0.0	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
<b>PUf (%)</b>	0.0	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 07 Feb 1970      **Lifetime Generation:** 205121.7 GW(e)·h  
**Date of First Criticality:** 20 Mar 1975      **Cumulative Energy Availability Factor:** 75.4%  
**Date of Grid Connection:** 29 Apr 1975      **Cumulative Load Factor:** 72.4%  
**Date of Commercial Operation:** 03 Nov 1975      **Cumulative Unit Capability Factor:** 75.7%  
**Cumulative Energy Unavailability Factor:** 24.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	706.8	804	93.2	93.2	93.2	93.2	58.8	58.8	1364	93.2
1976	2486.6	789	35.8	44.3	35.8	44.3	35.9	39.3	4911	55.9
1977	2436.6	790	35.3	40.1	35.3	40.1	35.2	37.4	4872	55.6
1978	4794.6	790	69.3	49.3	69.3	49.3	69.3	47.4	7018	80.1
1979	3652.1	790	52.8	50.1	52.8	50.1	52.8	48.7	5741	65.5
1980	1864.6	790	38.1	47.8	38.1	47.8	26.9	44.5	3086	35.1
1981	3283.9	790	68.0	51.1	68.0	51.1	47.5	45.0	5800	66.2
1982	1942.1	790	41.4	49.7	41.4	49.7	28.1	42.6	3378	38.6
1983	3941.7	790	65.3	51.6	65.3	51.6	57.0	44.4	5630	64.3
1984	1429.0	790	28.9	49.2	28.9	49.2	20.6	41.8	2236	25.5
1985	5021.9	790	84.1	52.6	80.0	52.2	72.6	44.8	6983	79.7
1986	2933.1	790	48.5	52.2	48.5	51.9	42.4	44.6	4027	46.0
1987	5694.1	790	94.0	55.6	94.0	55.3	82.3	47.7	8203	93.6
1988	3929.2	790	62.8	56.2	62.8	55.9	56.6	48.4	5361	61.0
1989	4195.4	790	67.4	57.0	67.4	56.7	60.6	49.2	5763	65.8
1990	4067.4	790	66.1	57.6	66.1	57.3	58.8	49.8	5616	64.1
1991	3664.2	775	57.8	57.6	57.8	57.3	54.0	50.1	4959	56.6
1992	1315.1	754	25.1	55.8	25.1	55.5	19.9	48.4	2200	25.0
1993	4000.9	754	63.1	56.2	63.1	55.9	60.6	49.1	5525	63.1
1994	4823.2	754	73.5	57.0	73.5	56.8	73.0	50.3	6436	73.5
1995	6216.0	754	100.0	59.1	100.0	58.9	94.1	52.3	8760	100.0
1996	5188.1	754	86.9	60.3	82.9	60.0	78.3	53.5	7277	82.8
1997	6055.4	754	89.2	61.6	89.2	61.2	91.7	55.2	7816	89.2
1998	6963.5	811	98.9	63.3	97.7	62.9	98.0	57.1	8539	97.5

1999	6095.2	811	89.2	64.4	86.5	63.9	85.8	58.3	7577	86.5
2000	7055.0	811	98.1	65.8	98.1	65.3	99.0	60.0	8616	98.1
2001	6540.4	811	91.3	66.8	91.3	66.3	92.1	61.3	7996	91.3
2002	7078.6	811	98.3	68.0	98.3	67.5	99.6	62.7	8609	98.3
2003	7028.1	811	91.0	68.8	91.0	68.4	98.9	64.1	7966	90.9
2004	7756.8	900	98.5	70.0	98.5	69.6	98.1	65.4	8639	98.3
2005	6781.7	811	88.2	70.6	88.2	70.2	95.4	66.4	7724	88.2
2006	7361.3	937	91.0	71.4	91.0	71.0	89.7	67.3	7972	91.0
2007	7140.3	937	87.3	72.0	87.3	71.6	87.0	68.0	7645	87.3
2008	7854.2	937	96.2	72.8	96.2	72.5	95.4	69.0	8448	96.2
2009	6410.2	920	80.3	73.1	80.3	72.7	79.5	69.3	7060	80.6
2010	8000.0	920	98.6	73.9	98.6	73.5	99.3	70.3	8639	98.6
2011	6336.7	920	79.9	74.1	79.9	73.7	78.6	70.6	6995	79.9
2012	7987.8	920	99.1	74.8	99.1	74.5	98.8	71.4	8704	99.1
2013	6385.3	920	80.6	75.0	80.6	74.7	79.2	71.6	7059	80.6
2014	7987.6	920	99.5	75.7	99.5	75.4	99.1	72.4	8715	99.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					578	
C. Inspection, maintenance or repair combined with refuelling				1103		
D. Inspection, maintenance or repair without refuelling	45			349		
E. Testing of plant systems or components				11	3	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements					6	
L. Human factor related					44	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						25
Z. Other					4	1
Subtotal	45	0	0	1463	635	26
Total	45			2124		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		20
13. Reactor Auxiliary Systems		11
14. Safety Systems		31
15. Reactor Cooling Systems		223
17. Safety I&C Systems (excluding reactor I&C)		6
21. Fuel Handling and Storage Facilities		26
31. Turbine and auxiliaries		76
32. Feedwater and Main Steam System		47
33. Circulating Water System		0
41. Main Generator Systems		35
42. Electrical Power Supply Systems		67
XX. Miscellaneous Systems		16
Total	0	571

# US-454 BYRON-1

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1164.0 MW(e)  
 Design Net Capacity: 1120.0 MW(e)  
 Design Discharge Burnup: 49000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9879.9 GW(e)·h  
 Energy Availability Factor: 95.1%  
 Load Factor: 96.9%  
 Operating Factor: 95.1%  
 Energy Unavailability Factor: 4.9%  
 Total Off-line Time: 432 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	880.9	803.8	338.8	864.2	885.8	852.6	880.8	877.7	855.9	883.6	868.0	887.7	9879.9
EAF (%)	100.0	100.0	41.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.1
UCF (%)	100.0	100.0	41.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.1
LF (%)	101.7	102.8	39.2	103.1	102.3	101.7	101.7	101.3	102.1	102.0	103.4	102.5	96.9
OF (%)	100.0	100.0	41.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.1
EUf (%)	0.0	0.0	58.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9
PUf (%)	0.0	0.0	58.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Apr 1975      Lifetime Generation: 251001.6 GW(e)·h  
 Date of First Criticality: 02 Feb 1985      Cumulative Energy Availability Factor: 88.8%  
 Date of Grid Connection: 01 Mar 1985      Cumulative Load Factor: 85.9%  
 Date of Commercial Operation: 16 Sep 1985      Cumulative Unit Capability Factor: 88.8%  
    Cumulative Energy Unavailability Factor: 11.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	1012.9	1124	46.8	46.8	46.8	46.8	34.9	34.9	1191	46.4
1986	7396.0	1129	89.1	79.5	89.1	79.5	74.8	65.7	7760	88.6
1987	5355.7	1125	69.6	75.2	68.7	74.8	54.3	60.8	6005	68.6
1988	6303.7	1112	72.9	74.5	72.9	74.2	64.5	61.9	6393	72.8
1989	8945.5	1105	99.7	80.3	99.7	80.1	92.4	68.9	8737	99.7
1990	6951.7	1105	80.3	80.3	80.3	80.1	71.8	69.5	7059	80.6
1991	6318.1	1105	81.3	80.5	81.3	80.3	65.3	68.8	7148	81.6
1992	8986.4	1105	99.3	83.0	99.3	82.9	92.6	72.0	8723	99.3
1993	7366.9	1105	80.9	82.8	80.9	82.7	76.1	72.5	7104	81.1
1994	6801.6	1105	81.2	82.6	81.2	82.5	70.3	72.3	7136	81.5
1995	7706.5	1105	82.3	82.6	82.3	82.5	79.6	73.0	7228	82.5
1996	6871.1	1105	74.7	81.9	74.7	81.8	70.8	72.8	6588	75.0
1997	7161.7	1105	76.8	81.5	76.8	81.4	74.0	72.9	6737	76.9
1998	7804.6	1105	81.5	81.5	81.5	81.4	80.6	73.5	7145	81.6
1999	8908.5	1105	90.6	82.1	90.6	82.1	92.0	74.8	7944	90.7
2000	9291.9	1105	94.2	82.9	94.2	82.8	95.7	76.1	8284	94.3
2001	10389.9	1163	100.0	84.0	100.0	83.9	104.1	77.9	8760	100.0
2002	9827.8	1163	94.1	84.6	94.1	84.5	96.5	79.0	8256	94.2
2003	9858.8	1163	94.0	85.1	94.0	85.1	96.8	80.0	8248	94.2
2004	10381.3	1152	100.0	85.9	100.0	85.9	102.2	81.2	8784	100.0
2005	9589.7	1194	92.9	86.3	92.9	86.2	91.7	81.8	8135	92.9
2006	9317.0	1164	90.4	86.5	90.4	86.4	91.4	82.2	7914	90.3
2007	10024.2	1164	96.8	87.0	96.8	86.9	98.3	83.0	8482	96.8
2008	9733.4	1164	94.1	87.3	94.1	87.2	95.2	83.5	8266	94.1

2009	9609.4	1164	93.3	87.5	93.3	87.5	94.2	84.0	8169	93.3
2010	10337.3	1164	100.0	88.0	100.0	88.0	101.4	84.7	8760	100.0
2011	8978.8	1164	88.6	88.1	88.6	88.0	88.1	84.8	7759	88.6
2012	8925.1	1164	90.9	88.2	90.9	88.1	87.3	84.9	7984	90.9
2013	10283.3	1164	100.0	88.6	100.0	88.6	100.8	85.5	8760	100.0
2014	9879.9	1164	95.1	88.8	95.1	88.8	96.9	85.9	8328	95.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					55	
C. Inspection, maintenance or repair combined with refuelling	432			718		
D. Inspection, maintenance or repair without refuelling				146		
E. Testing of plant systems or components					0	
H. Nuclear regulatory requirements					11	
L. Human factor related					8	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
Z. Other				3	2	
Subtotal	432	0	0	867	76	3
Total		432			946	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		5
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		7
41. Main Generator Systems		0
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		3
Total	0	50

# US-455 BYRON-2

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1136.0 MW(e)  
 Design Net Capacity: 1120.0 MW(e)  
 Design Discharge Burnup: 49000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9372.5 GW(e)·h  
 Energy Availability Factor: 93.1%  
 Load Factor: 94.2%  
 Operating Factor: 93.1%  
 Energy Unavailability Factor: 6.9%  
 Total Off-line Time: 602 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	818.4	782.2	867.8	826.8	860.9	827.6	856.7	854.4	767.5	193.3	844.2	872.8	9372.5
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.3	25.6	100.0	100.0	93.1
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.3	25.6	100.0	100.0	93.1
LF (%)	96.8	102.5	102.8	101.1	101.9	101.2	101.4	101.1	93.8	22.9	103.1	103.3	94.2
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.3	25.5	100.0	100.0	93.1
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	74.4	0.0	0.0	6.9
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	74.4	0.0	0.0	6.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Apr 1975      Lifetime Generation: 242445.0 GW(e)·h  
 Date of First Criticality: 09 Jan 1987      Cumulative Energy Availability Factor: 92.4%  
 Date of Grid Connection: 06 Feb 1987      Cumulative Load Factor: 89.3%  
 Date of Commercial Operation: 02 Aug 1987      Cumulative Unit Capability Factor: 92.4%  
    Cumulative Energy Unavailability Factor: 7.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	1970.9	1128	100.0	100.0	100.0	100.0	47.5	47.5	2310	62.9
1988	6357.9	1112	95.9	97.1	95.9	97.1	65.1	59.8	8419	95.8
1989	6069.5	1105	79.5	89.9	79.5	89.9	62.7	61.0	6981	79.7
1990	6052.7	1105	75.0	85.5	75.0	85.5	62.5	61.5	6598	75.3
1991	8772.7	1105	96.9	88.1	96.9	88.1	90.6	68.0	8489	96.9
1992	7000.3	1105	79.8	86.6	79.8	86.6	72.1	68.8	7027	80.0
1993	7622.5	1105	84.3	86.2	84.3	86.2	78.7	70.3	7399	84.5
1994	9504.2	1105	99.4	88.0	99.4	88.0	98.2	74.1	8704	99.4
1995	8183.8	1105	87.9	88.0	87.9	88.0	84.5	75.3	7710	88.0
1996	7830.6	1105	82.0	87.3	82.0	87.3	80.7	75.9	7225	82.3
1997	9102.9	1105	95.2	88.1	95.2	88.1	94.0	77.6	8344	95.3
1998	8592.8	1105	89.5	88.2	89.5	88.2	88.8	78.6	7855	89.7
1999	9174.1	1105	93.3	88.6	93.3	88.6	94.8	79.9	8182	93.4
2000	10005.4	1105	99.3	89.4	99.3	89.4	103.1	81.6	8724	99.3
2001	9826.7	1131	95.3	89.8	95.3	89.8	100.1	82.9	8353	95.4
2002	9537.6	1131	92.3	90.0	92.3	90.0	96.3	83.8	8119	92.7
2003	10298.7	1131	100.0	90.6	100.0	90.6	103.9	85.1	8760	100.0
2004	9623.2	1125	95.0	90.9	95.0	90.9	97.2	85.8	8360	95.2
2005	9521.0	1162	95.1	91.1	95.1	91.1	93.5	86.2	8328	95.1
2006	10158.7	1136	100.0	91.6	100.0	91.6	102.1	87.0	8760	100.0
2007	8828.6	1136	88.3	91.4	88.3	91.4	88.7	87.1	7736	88.3
2008	9624.2	1136	94.9	91.6	94.9	91.6	96.4	87.6	8339	94.9
2009	10108.9	1136	100.0	92.0	100.0	92.0	101.6	88.2	8760	100.0
2010	9518.4	1136	94.8	92.1	94.8	92.1	95.6	88.5	8300	94.7



2011	9223.9	1136	92.6	92.1	92.6	92.1	92.7	88.7	8115	92.6
2012	9393.2	1136	97.2	92.3	97.2	92.3	94.1	88.9	8536	97.2
2013	9263.8	1136	93.1	92.3	93.1	92.3	93.1	89.1	8160	93.1
2014	9372.5	1136	93.1	92.4	93.1	92.4	94.2	89.3	8158	93.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					69	
C. Inspection, maintenance or repair combined with refuelling	601			527		
D. Inspection, maintenance or repair without refuelling				39		
H. Nuclear regulatory requirements					9	
Z. Other					6	
Subtotal	601	0	0	566	84	0
Total	601			650		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		4
15. Reactor Cooling Systems		8
16. Steam generation systems		15
17. Safety I&C Systems (excluding reactor I&C)		2
32. Feedwater and Main Steam System		6
35. All other I&C Systems		1
41. Main Generator Systems		9
42. Electrical Power Supply Systems		7
XX. Miscellaneous Systems		11
Total	0	65

**US-483 CALLAWAY-1****Operator:** AmerenUE (AMEREN UE, Union Electric Company)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1215.0 MW(e)

**Design Net Capacity:** 1171.0 MW(e)

**Design Discharge Burnup:** 42000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 9297.3 GW(e)·h

**Energy Availability Factor:** 87.3%

**Load Factor:** 87.4%

**Operating Factor:** 87.3%

**Energy Unavailability Factor:** 12.7%

**Total Off-line Time:** 1111 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	924.2	834.5	919.7	883.9	903.1	864.9	891.4	889.4	871.4	293.2	221.8	799.9	9297.3
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	32.6	28.1	87.6	87.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	32.6	28.1	87.6	87.3
<b>LF (%)</b>	102.2	102.2	101.9	101.0	99.9	98.9	98.6	98.4	99.6	32.4	25.3	88.5	87.4
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	32.7	28.2	87.6	87.3
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.4	71.9	12.4	12.7
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.4	71.9	0.0	11.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4	1.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 01 Sep 1975      **Lifetime Generation:** 264581.8 GW(e)·h

**Date of First Criticality:** 02 Oct 1984      **Cumulative Energy Availability Factor:** 88.4%

**Date of Grid Connection:** 24 Oct 1984      **Cumulative Load Factor:** 87.6%

**Date of Commercial Operation:** 19 Dec 1984      **Cumulative Unit Capability Factor:** 88.4%

**Cumulative Energy Unavailability Factor:** 11.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	323.0	1140	100.0	100.0	100.0	100.0	90.0	90.0	303	100.0
1985	8045.8	1120	90.0	90.3	90.0	90.3	82.0	82.3	7882	90.0
1986	7199.1	1120	81.6	86.0	81.6	86.0	73.4	77.9	7121	81.3
1987	6321.8	1120	70.0	80.8	70.0	80.8	64.4	73.5	6141	70.1
1988	8144.2	1120	92.5	83.7	92.5	83.7	82.8	75.8	7413	84.4
1989	8350.9	1118	84.0	83.8	84.0	83.8	85.3	77.7	7368	84.1
1990	8005.1	1125	81.8	83.4	81.8	83.4	81.2	78.3	7167	81.8
1991	9979.4	1125	99.6	85.7	99.6	85.7	101.3	81.5	8726	99.6
1992	8094.6	1125	82.0	85.3	82.0	85.3	81.9	81.6	7204	82.0
1993	8390.0	1120	85.5	85.3	85.5	85.3	85.5	82.0	7498	85.6
1994	10006.5	1115	99.6	86.7	99.6	86.7	102.4	84.0	8726	99.6
1995	8252.8	1125	84.0	86.5	84.0	86.5	83.7	84.0	7356	84.0
1996	8890.4	1125	89.6	86.7	89.6	86.7	90.0	84.5	7864	89.5
1997	8954.6	1125	100.0	87.8	100.0	87.8	90.9	85.0	8760	100.0
1998	8516.8	1125	90.4	87.9	90.4	87.9	86.4	85.1	7913	90.3
1999	8596.4	1125	87.8	87.9	87.8	87.9	87.2	85.2	7707	88.0
2000	9991.8	1125	100.0	88.7	99.7	88.7	101.1	86.2	8762	99.7
2001	8384.1	1125	85.4	88.5	85.4	88.5	85.1	86.2	7500	85.6
2002	8386.6	1125	85.2	88.3	85.2	88.3	85.1	86.1	7484	85.4
2003	9699.7	1125	95.8	88.7	95.8	88.7	98.4	86.8	8397	95.9
2004	7842.4	1125	77.9	88.2	77.9	88.2	79.4	86.4	6856	78.1
2005	8021.2	1137	79.6	87.7	79.6	87.7	80.5	86.1	6966	79.5
2006	10098.9	1190	95.0	88.1	95.0	88.1	96.9	86.6	8324	95.0
2007	9372.0	1190	88.4	88.1	88.4	88.1	89.9	86.8	7742	88.4

2008	9378.2	1190	89.2	88.2	89.2	88.1	89.7	86.9	7834	89.2
2009	10247.1	1190	96.0	88.5	96.0	88.5	98.3	87.4	8408	96.0
2010	9011.0	1190	84.6	88.3	84.6	88.3	86.4	87.3	7412	84.6
2011	9387.9	1215	88.7	88.3	88.7	88.3	89.9	87.4	7771	88.7
2012	10718.3	1215	100.0	88.8	100.0	88.8	100.4	87.9	8784	100.0
2013	8408.9	1215	80.0	88.5	80.0	88.5	79.0	87.6	7008	80.0
2014	9297.3	1215	87.3	88.4	87.3	88.4	87.4	87.6	7649	87.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		92			162	
C. Inspection, maintenance or repair combined with refuelling	1019			697		
D. Inspection, maintenance or repair without refuelling				71		
E. Testing of plant systems or components				0	0	
H. Nuclear regulatory requirements					0	
L. Human factor related					7	
Z. Other					5	0
Subtotal	1019	92	0	768	174	0
Total		1111			942	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		1
14. Safety Systems		0
15. Reactor Cooling Systems		12
16. Steam generation systems		3
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		33
33. Circulating Water System		11
35. All other I&C Systems		2
41. Main Generator Systems	92	8
42. Electrical Power Supply Systems		42
XX. Miscellaneous Systems		5
Total	92	155

# US-317 CALVERT CLIFFS-1

**Operator:** EXELON (Exelon Generation Co., LLC)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 866.0 MW(e)  
**Design Net Capacity:** 845.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6928.8 GW(e)·h  
**Energy Availability Factor:** 89.8%  
**Load Factor:** 91.3%  
**Operating Factor:** 89.8%  
**Energy Unavailability Factor:** 10.2%  
**Total Off-line Time:** 892 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	572.9	329.7	233.8	653.1	614.1	644.7	626.5	641.8	628.3	661.0	648.8	674.0	6928.8
<b>EAF (%)</b>	89.5	55.1	37.8	100.0	93.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.8
<b>UCF (%)</b>	89.5	55.1	37.9	100.0	93.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.8
<b>LF (%)</b>	88.9	56.7	36.3	104.8	95.3	103.4	97.2	99.6	100.8	102.6	103.9	104.6	91.3
<b>OF (%)</b>	89.5	55.1	37.8	100.0	93.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.8
<b>EUf (%)</b>	10.5	44.9	62.2	0.0	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2
<b>PUf (%)</b>	0.0	44.9	62.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7
<b>UCLF (%)</b>	10.5	0.0	0.0	0.0	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1968  
**Date of First Criticality:** 07 Oct 1974  
**Date of Grid Connection:** 03 Jan 1975  
**Date of Commercial Operation:** 08 May 1975

**Lifetime Generation:** 233782.0 GW(e)·h  
**Cumulative Energy Availability Factor:** 79.6%  
**Cumulative Load Factor:** 80.3%  
**Cumulative Unit Capability Factor:** 79.8%  
**Cumulative Energy Unavailability Factor:** 20.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	3641.1	800	77.2	77.2	77.2	77.2	77.4	77.4	4807	81.8
1976	6303.9	800	89.7	84.7	89.7	84.7	89.7	84.8	8356	95.1
1977	4882.0	807	68.6	78.6	68.6	78.6	69.1	78.9	6313	72.1
1978	4676.1	810	65.9	75.2	65.9	75.2	65.9	75.3	6150	70.2
1979	4194.1	810	59.1	71.7	59.1	71.7	59.1	71.8	6154	70.3
1980	4542.5	810	77.0	72.6	72.2	71.8	63.8	70.4	6349	72.3
1981	6109.6	821	86.4	74.7	86.4	74.0	85.0	72.6	7544	86.1
1982	5362.1	825	73.9	74.6	73.9	74.0	74.2	72.8	6419	73.3
1983	5570.7	825	77.0	74.9	77.0	74.4	77.1	73.3	6719	76.7
1984	6221.6	825	86.7	76.1	84.3	75.4	85.9	74.6	7422	84.5
1985	4359.7	825	58.8	74.5	58.8	73.8	60.3	73.3	5186	59.2
1986	5830.7	825	78.2	74.8	78.2	74.2	80.7	73.9	6855	78.3
1987	5268.5	825	70.9	74.5	70.9	73.9	72.9	73.8	6233	71.2
1988	5164.2	825	71.0	74.2	71.0	73.7	71.3	73.7	6263	71.3
1989	1345.6	825	18.8	70.4	18.8	69.9	18.6	69.9	1727	19.7
1990	1344.4	825	20.1	67.2	20.1	66.7	18.6	66.6	1840	21.0
1991	5465.3	825	75.5	67.7	75.5	67.3	75.6	67.1	6638	75.8
1992	4113.9	825	55.6	67.0	55.6	66.6	56.8	66.5	4927	56.1
1993	7334.9	827	98.2	68.7	98.2	68.3	101.2	68.4	8599	98.2
1994	4686.4	832	64.6	68.5	64.6	68.1	64.2	68.2	5656	64.6
1995	7030.2	835	96.9	69.9	96.9	69.5	96.1	69.6	8487	96.9
1996	4846.9	835	65.7	69.7	65.7	69.3	66.1	69.4	5762	65.6
1997	7158.4	835	95.9	70.9	95.9	70.5	97.9	70.7	8400	95.9
1998	6116.8	835	82.0	71.3	82.0	71.0	83.6	71.2	7184	82.0

1999	6994.3	835	96.8	72.4	94.0	72.0	95.6	72.2	8231	94.0
2000	6449.6	827	86.2	72.9	86.2	72.5	88.7	72.9	7580	86.3
2001	7454.8	825	99.6	73.9	99.6	73.5	103.2	74.0	8727	99.6
2002	4645.2	825	62.8	73.5	62.8	73.2	64.3	73.7	5506	62.9
2003	7532.5	825	100.0	74.4	100.0	74.1	104.2	74.7	8760	100.0
2004	6974.0	870	91.5	75.0	91.5	74.7	93.3	75.4	8034	91.5
2005	7626.3	845	99.6	75.9	99.6	75.5	103.0	76.3	8726	99.6
2006	6449.8	873	84.3	76.1	84.3	75.8	84.3	76.6	7386	84.3
2007	7545.4	873	99.3	76.9	99.3	76.6	98.7	77.3	8701	99.3
2008	7161.1	873	94.2	77.4	94.2	77.1	93.4	77.8	8275	94.2
2009	7528.6	873	98.9	78.1	98.9	77.8	98.4	78.4	8661	98.9
2010	6755.0	855	89.0	78.4	89.0	78.1	90.2	78.7	7814	89.2
2011	7542.5	855	100.0	79.0	99.0	78.7	100.7	79.4	8676	99.0
2012	6070.2	866	79.1	79.0	79.1	78.7	80.1	79.4	6930	78.9
2013	7815.2	866	100.0	79.6	100.0	79.3	103.0	80.0	8760	100.0
2014	6928.8	866	89.8	79.8	89.8	79.6	91.3	80.3	7868	89.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		127			298	
C. Inspection, maintenance or repair combined with refuelling	763			890		
D. Inspection, maintenance or repair without refuelling				420		
E. Testing of plant systems or components				39		
H. Nuclear regulatory requirements					22	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					7	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						11
Z. Other					20	
Subtotal	763	127	0	1349	347	13
Total		890			1709	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems	49	10
13. Reactor Auxiliary Systems		56
14. Safety Systems		33
15. Reactor Cooling Systems		58
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries		55
32. Feedwater and Main Steam System		41
33. Circulating Water System		1
35. All other I&C Systems		1
41. Main Generator Systems		5
42. Electrical Power Supply Systems	77	12
XX. Miscellaneous Systems		1
Total	126	290

# US-318 CALVERT CLIFFS-2

**Operator:** EXELON (Exelon Generation Co., LLC)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 850.0 MW(e)  
**Design Net Capacity:** 845.0 MW(e)  
**Design Discharge Burnup:** 45000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 7422.5 GW(e)·h  
**Energy Availability Factor:** 98.9%  
**Load Factor:** 99.7%  
**Operating Factor:** 98.9%  
**Energy Unavailability Factor:** 1.1%  
**Total Off-line Time:** 98 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	558.4	590.2	651.4	630.9	644.7	601.7	611.5	620.5	597.7	635.7	628.2	651.7	7422.5
<b>EAF (%)</b>	86.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.9
<b>UCF (%)</b>	86.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.9
<b>LF (%)</b>	88.3	103.3	103.1	103.1	101.9	98.3	96.7	98.1	97.7	100.5	102.5	103.1	99.7
<b>OF (%)</b>	86.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.9
<b>EUf (%)</b>	13.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	13.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1968  
**Date of First Criticality:** 30 Nov 1976  
**Date of Grid Connection:** 07 Dec 1976  
**Date of Commercial Operation:** 01 Apr 1977

**Lifetime Generation:** 231188.3 GW(e)·h  
**Cumulative Energy Availability Factor:** 83.2%  
**Cumulative Load Factor:** 83.0%  
**Cumulative Unit Capability Factor:** 83.3%  
**Cumulative Energy Unavailability Factor:** 16.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	4541.5	810	100.0	100.0	100.0	100.0	85.0	85.0	5676	86.0
1978	5226.6	810	72.8	84.5	72.8	84.5	73.7	78.5	7129	81.4
1979	5489.0	812	76.6	81.6	76.6	81.6	77.2	78.0	6792	77.5
1980	6412.3	825	98.9	86.3	96.2	85.6	88.5	80.9	8425	95.9
1981	5416.0	825	80.1	85.0	80.1	84.4	74.9	79.6	7005	80.0
1982	5005.2	825	74.2	83.1	74.2	82.6	69.3	77.8	6496	74.2
1983	6113.1	825	86.4	83.6	86.4	83.2	84.6	78.8	7567	86.4
1984	5338.4	825	73.7	82.3	73.7	82.0	73.7	78.1	6502	74.0
1985	5608.0	825	77.4	81.7	77.4	81.4	77.6	78.1	6789	77.5
1986	7006.7	825	96.0	83.2	96.0	82.9	97.0	80.0	8405	95.9
1987	4832.0	825	66.3	81.6	66.3	81.4	66.9	78.8	5859	66.9
1988	6602.7	825	88.8	82.2	88.8	82.0	91.1	79.8	7813	88.9
1989	1448.5	825	18.3	77.2	18.3	77.0	20.0	75.1	1731	19.8
1990	0.0	825	0.0	71.6	0.0	71.4	0.0	69.7	0	0.0
1991	3635.6	825	51.3	70.2	51.3	70.0	50.3	68.3	4515	51.5
1992	6590.3	825	89.3	71.4	89.3	71.3	90.9	69.8	7855	89.4
1993	4975.2	827	67.4	71.2	67.4	71.0	68.6	69.7	5939	67.8
1994	6576.5	835	90.6	72.3	90.6	72.1	89.8	70.9	7925	90.5
1995	5911.1	840	81.4	72.8	81.4	72.6	80.3	71.4	7121	81.3
1996	7247.7	840	97.5	74.1	97.5	73.9	98.2	72.8	8561	97.5
1997	5979.9	840	81.1	74.4	81.1	74.3	81.3	73.2	7100	81.1
1998	7225.5	840	95.8	75.4	95.8	75.3	98.2	74.3	8393	95.8
1999	6332.7	840	84.5	75.8	84.5	75.7	86.1	74.9	7400	84.5
2000	7391.0	835	98.1	76.8	98.1	76.6	100.7	76.0	8614	98.1

2001	6201.5	835	83.3	77.0	83.3	76.9	84.8	76.3	7297	83.3
2002	7480.6	835	100.0	77.9	100.0	77.8	102.3	77.3	8760	100.0
2003	6156.9	835	81.4	78.0	81.4	77.9	84.2	77.6	7124	81.3
2004	7552.2	858	99.4	78.8	99.4	78.7	101.3	78.5	8729	99.4
2005	7114.3	858	94.2	79.4	94.2	79.3	94.6	79.1	8249	94.2
2006	7406.3	862	98.4	80.1	98.4	80.0	98.1	79.7	8621	98.4
2007	6807.8	862	90.2	80.4	90.2	80.3	90.2	80.1	7902	90.2
2008	7514.7	862	100.0	81.0	100.0	81.0	99.2	80.7	8784	100.0
2009	7021.5	862	93.9	81.4	93.9	81.4	93.0	81.1	8227	93.9
2010	7238.9	850	97.3	81.9	97.3	81.8	97.2	81.6	8528	97.4
2011	6787.9	850	91.4	82.2	91.4	82.1	91.2	81.9	8005	91.4
2012	7506.5	850	100.0	82.7	100.0	82.6	100.5	82.4	8784	100.0
2013	6486.8	850	87.4	82.8	87.4	82.8	87.1	82.5	7652	87.3
2014	7422.5	850	98.9	83.3	98.9	83.2	99.7	83.0	8662	98.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		98			215	
C. Inspection, maintenance or repair combined with refuelling				1119		
D. Inspection, maintenance or repair without refuelling				72		
E. Testing of plant systems or components				8	0	
H. Nuclear regulatory requirements					7	
L. Human factor related					15	
Z. Other					0	
Subtotal	0	98	0	1199	237	0
Total		98			1436	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		15
13. Reactor Auxiliary Systems		22
14. Safety Systems		1
15. Reactor Cooling Systems		65
16. Steam generation systems		8
31. Turbine and auxiliaries		23
32. Feedwater and Main Steam System		32
35. All other I&C Systems		2
41. Main Generator Systems		13
42. Electrical Power Supply Systems	98	26
XX. Miscellaneous Systems		0
Total	98	209

**US-413 CATAWBA-1****Operator:** DUKEENER (Duke Energy Corp.)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1146.0 MW(e)

**Design Net Capacity:** 1145.0 MW(e)

**Design Discharge Burnup:** 40200 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 8619.6 GW(e)·h

**Energy Availability Factor:** 85.5%

**Load Factor:** 85.9%

**Operating Factor:** 85.5%

**Energy Unavailability Factor:** 14.5%

**Total Off-line Time:** 1267 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	867.2	780.5	864.6	832.6	133.3	50.4	848.9	850.8	825.0	859.1	839.9	867.4	8619.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	16.7	10.2	100.0	100.0	100.0	100.0	100.0	100.0	85.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	16.7	10.2	100.0	100.0	100.0	100.0	100.0	100.0	85.5
<b>LF (%)</b>	101.7	101.3	101.5	100.9	15.6	6.1	99.6	99.8	100.0	100.8	101.7	101.7	85.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	16.7	10.1	100.0	100.0	100.0	100.0	100.0	100.0	85.5
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	83.3	89.8	0.0	0.0	0.0	0.0	0.0	0.0	14.5
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	83.3	89.8	0.0	0.0	0.0	0.0	0.0	0.0	14.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 01 May 1974      **Lifetime Generation:** 248266.3 GW(e)·h

**Date of First Criticality:** 07 Jan 1985      **Cumulative Energy Availability Factor:** 85.4%

**Date of Grid Connection:** 22 Jan 1985      **Cumulative Load Factor:** 84.8%

**Date of Commercial Operation:** 29 Jun 1985      **Cumulative Unit Capability Factor:** 85.4%

**Cumulative Energy Unavailability Factor:** 14.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	3440.5	1138	78.8	78.8	78.8	78.8	67.3	67.3	3513	78.7
1986	5199.1	1145	58.9	65.6	58.9	65.6	51.8	57.1	5151	58.8
1987	6406.0	1145	68.0	66.6	68.0	66.6	63.9	59.8	5924	67.6
1988	7640.0	1129	79.8	70.3	79.8	70.3	77.0	64.6	7003	79.7
1989	7775.4	1129	84.7	73.4	84.7	73.4	78.6	67.7	7278	83.1
1990	6900.5	1129	71.7	73.1	71.7	73.1	69.8	68.1	6277	71.7
1991	6681.1	1129	71.1	72.8	71.1	72.8	67.6	68.0	6227	71.1
1992	7050.9	1129	72.1	72.7	72.1	72.7	71.1	68.4	6338	72.2
1993	7597.1	1129	79.0	73.5	79.0	73.5	76.8	69.4	6916	78.9
1994	9778.8	1129	99.6	76.2	99.6	76.2	98.9	72.5	8722	99.6
1995	8721.6	1129	88.1	77.3	88.1	77.3	88.2	74.0	7712	88.0
1996	6341.1	1129	66.2	76.4	66.2	76.4	63.9	73.1	5806	66.1
1997	9192.5	1129	90.7	77.5	90.7	77.5	92.9	74.7	7966	90.9
1998	8903.7	1129	90.5	78.5	90.5	78.5	90.0	75.8	7923	90.4
1999	9073.7	1129	91.2	79.3	91.2	79.3	91.7	76.9	7987	91.2
2000	8923.0	1129	89.3	80.0	89.3	80.0	90.0	77.8	7844	89.3
2001	9977.0	1129	99.6	81.2	99.6	81.2	100.9	79.2	8722	99.6
2002	9481.6	1129	94.2	81.9	94.2	81.9	95.9	80.1	8250	94.2
2003	8198.5	1129	81.7	81.9	81.7	81.9	82.9	80.3	7157	81.7
2004	9711.1	1129	98.0	82.7	98.0	82.7	97.9	81.2	8608	98.0
2005	9177.3	1129	91.7	83.1	91.7	83.1	92.8	81.7	8027	91.6
2006	8115.0	1129	80.7	83.0	80.7	83.0	82.1	81.7	7066	80.7
2007	10070.9	1129	99.6	83.8	99.6	83.8	101.8	82.6	8728	99.6
2008	8773.3	1129	86.6	83.9	86.6	83.9	88.5	82.9	7610	86.6



2009	9002.0	1129	89.5	84.1	89.5	84.1	91.0	83.2	7834	89.4
2010	9889.1	1129	98.5	84.7	98.5	84.7	100.0	83.9	8629	98.5
2011	8758.0	1146	87.2	84.8	87.2	84.8	87.8	84.0	7630	87.1
2012	8767.3	1146	87.2	84.9	87.2	84.9	87.1	84.1	7657	87.2
2013	10100.4	1146	100.0	85.4	100.0	85.4	100.6	84.7	8760	100.0
2014	8619.6	1146	85.5	85.4	85.5	85.4	85.9	84.8	7493	85.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					273	
C. Inspection, maintenance or repair combined with refuelling	1266			866		
D. Inspection, maintenance or repair without refuelling				47		
E. Testing of plant systems or components				1	3	
H. Nuclear regulatory requirements					4	
L. Human factor related					5	
Z. Other				2	5	
Subtotal	1266	0	0	916	290	0
Total	1266			1206		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		25
13. Reactor Auxiliary Systems		9
14. Safety Systems		19
15. Reactor Cooling Systems		97
16. Steam generation systems		2
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		48
33. Circulating Water System		10
41. Main Generator Systems		9
42. Electrical Power Supply Systems		25
XX. Miscellaneous Systems		7
Total	0	267

# US-414 CATAWBA-2

Operator: DUKEENER (Duke Energy Corp.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1146.0 MW(e)  
 Design Net Capacity: 1145.0 MW(e)  
 Design Discharge Burnup: 40200 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 10091.9 GW(e)·h  
 Energy Availability Factor: 100.0%  
 Load Factor: 100.5%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.0%  
 Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	872.9	785.1	869.2	836.5	858.5	822.8	792.3	854.0	829.4	861.9	840.9	868.2	10091.9
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	102.4	101.9	102.1	101.4	100.7	99.7	92.9	100.2	100.5	101.1	101.8	101.8	100.5
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 May 1974      Lifetime Generation: 242236.1 GW(e)·h  
 Date of First Criticality: 08 May 1986      Cumulative Energy Availability Factor: 86.7%  
 Date of Grid Connection: 18 May 1986      Cumulative Load Factor: 86.1%  
 Date of Commercial Operation: 19 Aug 1986      Cumulative Unit Capability Factor: 86.7%  
    Cumulative Energy Unavailability Factor: 13.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	1324.2	1135	41.8	41.8	41.8	41.8	35.7	35.7	1325	40.9
1987	7169.5	1145	80.2	69.8	80.2	69.8	71.5	61.8	7014	80.1
1988	5435.0	1129	71.8	70.6	71.8	70.6	54.8	58.9	5571	63.4
1989	6527.1	1129	72.0	71.0	72.0	71.0	66.0	61.0	6302	71.9
1990	6503.0	1129	69.0	70.6	69.0	70.6	65.8	62.1	5984	68.3
1991	7274.9	1129	75.6	71.5	75.6	71.5	73.6	64.2	6621	75.6
1992	9273.5	1129	94.3	75.1	94.3	75.1	93.5	68.8	8281	94.3
1993	8177.4	1129	82.6	76.1	82.6	76.1	82.7	70.7	7233	82.6
1994	7691.7	1129	79.7	76.5	79.7	76.5	77.8	71.5	6978	79.7
1995	7960.2	1129	80.8	77.0	80.8	77.0	80.5	72.5	7074	80.8
1996	9233.6	1129	92.3	78.5	92.3	78.5	93.1	74.5	8107	92.3
1997	8593.4	1129	87.1	79.2	87.1	79.2	86.9	75.6	7623	87.0
1998	8672.3	1129	86.5	79.8	86.5	79.8	87.7	76.5	7580	86.5
1999	8855.4	1129	88.2	80.4	88.2	80.4	89.5	77.5	7727	88.2
2000	8981.4	1129	90.3	81.1	90.3	81.1	90.6	78.4	7928	90.3
2001	8574.1	1129	85.7	81.4	85.7	81.4	86.7	78.9	7507	85.7
2002	10172.3	1129	100.0	82.6	100.0	82.6	102.9	80.4	8760	100.0
2003	9318.2	1129	92.7	83.1	92.7	83.1	94.2	81.2	8117	92.7
2004	8835.7	1129	87.4	83.4	87.4	83.4	89.1	81.6	7672	87.3
2005	10099.1	1129	99.7	84.2	99.7	84.2	102.1	82.7	8737	99.7
2006	8779.2	1129	87.9	84.4	87.9	84.4	88.8	83.0	7696	87.9
2007	8351.6	1129	82.9	84.3	82.9	84.3	84.4	83.1	7262	82.9
2008	10203.2	1129	100.0	85.0	100.0	85.0	102.9	83.9	8784	100.0
2009	8910.2	1129	88.2	85.2	88.2	85.2	90.1	84.2	7727	88.2

2010	9075.0	1129	90.6	85.4	90.6	85.4	91.8	84.5	7934	90.6
2011	10025.5	1129	99.5	85.9	99.5	85.9	101.4	85.2	8716	99.5
2012	9062.0	1146	89.5	86.1	89.5	86.1	90.4	85.4	7849	89.4
2013	9065.6	1146	90.7	86.2	90.7	86.2	90.3	85.6	7942	90.7
2014	10091.9	1146	100.0	86.7	100.0	86.7	100.5	86.1	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					330	
C. Inspection, maintenance or repair combined with refuelling				724		
D. Inspection, maintenance or repair without refuelling				61		
E. Testing of plant systems or components				3	3	
H. Nuclear regulatory requirements					5	
L. Human factor related					1	
Z. Other				0	7	
Subtotal	0	0	0	788	346	0
Total	0			1134		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		20
14. Safety Systems		7
15. Reactor Cooling Systems		28
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		11
31. Turbine and auxiliaries		51
32. Feedwater and Main Steam System		72
33. Circulating Water System		0
41. Main Generator Systems		99
42. Electrical Power Supply Systems		30
XX. Miscellaneous Systems		0
Total	0	325

# US-461 CLINTON-1

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1065.0 MW(e)

Design Net Capacity: 950.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9098.0 GW(e)·h

Energy Availability Factor: 98.3%

Load Factor: 97.5%

Operating Factor: 98.3%

Energy Unavailability Factor: 1.7%

Total Off-line Time: 145 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	798.1	704.9	554.0	771.7	787.7	766.6	791.6	790.9	763.5	797.6	774.0	797.4	9098.0
EAF (%)	100.0	100.0	80.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.3
UCF (%)	100.0	100.0	80.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.3
LF (%)	100.7	98.5	70.0	100.6	99.4	100.0	99.9	99.8	99.6	100.7	100.8	100.6	97.5
OF (%)	100.0	100.0	80.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.3
EUf (%)	0.0	0.0	19.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
PUf (%)	0.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
UCLF (%)	0.0	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Oct 1975      Lifetime Generation: 181157.8 GW(e)·h

Date of First Criticality: 27 Feb 1987      Cumulative Energy Availability Factor: 79.4%

Date of Grid Connection: 24 Apr 1987      Cumulative Load Factor: 76.9%

Date of Commercial Operation: 24 Nov 1987      Cumulative Unit Capability Factor: 79.5%

   Cumulative Energy Unavailability Factor: 20.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987	684.1	932	100.0	100.0	100.0	100.0	50.1	50.1	898	61.3
1988	5860.7	930	82.5	85.0	82.5	85.0	71.7	68.6	7244	82.5
1989	2861.9	931	45.1	66.6	45.1	66.6	35.1	53.2	3947	45.1
1990	3596.6	930	52.6	62.2	52.6	62.2	44.1	50.3	4604	52.6
1991	6048.0	930	79.1	66.2	79.1	66.2	74.2	56.1	6927	79.1
1992	4935.3	930	66.3	66.3	66.3	66.3	60.4	56.9	5824	66.3
1993	5879.2	930	77.1	68.0	77.1	68.0	72.2	59.4	6750	77.1
1994	7410.3	930	93.8	71.6	93.8	71.6	91.0	63.8	8217	93.8
1995	6109.2	930	81.6	72.8	81.6	72.8	75.0	65.1	7140	81.5
1996	5312.9	930	66.5	72.1	66.5	72.1	65.0	65.1	5833	66.4
1997	0.0	930	0.0	65.1	0.0	65.0	0.0	58.7	0	0.0
1998	0.0	930	0.0	59.2	0.0	59.2	0.0	53.5	0	0.0
1999	4704.2	930	60.2	59.3	60.2	59.3	57.7	53.8	5270	60.2
2000	6888.8	930	85.9	61.3	85.9	61.3	84.3	56.1	7542	85.9
2001	7877.2	930	97.8	63.9	97.8	63.9	96.7	59.0	8565	97.8
2002	7657.5	1022	89.8	65.7	89.8	65.7	88.8	61.1	7805	89.1
2003	8700.8	1022	98.6	67.9	98.6	67.9	97.2	63.5	8634	98.6
2004	8000.4	1022	91.5	69.4	90.0	69.3	89.1	65.1	7911	90.1
2005	8688.7	1026	97.0	71.0	97.0	71.0	96.7	67.0	8497	97.0
2006	8233.3	1052	91.1	72.2	91.1	72.1	89.3	68.3	7974	91.0
2007	9250.4	1043	99.5	73.7	99.5	73.6	101.2	70.1	8714	99.5
2008	8546.5	1043	92.9	74.7	92.9	74.6	93.3	71.3	8160	92.9
2009	8887.9	1043	95.8	75.7	95.8	75.6	97.3	72.5	8390	95.8
2010	8612.0	1065	92.5	76.5	92.5	76.4	92.3	73.5	8089	92.3

2011	8671.5	1065	93.4	77.2	93.4	77.2	92.9	74.3	8184	93.4
2012	9373.7	1065	100.0	78.2	100.0	78.2	100.2	75.5	8784	100.0
2013	8323.9	1065	89.7	78.7	89.7	78.7	89.2	76.0	7861	89.7
2014	9098.0	1065	98.3	79.5	98.3	79.4	97.5	76.9	8615	98.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		41			292	
C. Inspection, maintenance or repair combined with refuelling				1373		
D. Inspection, maintenance or repair without refuelling	104			148		
E. Testing of plant systems or components				2		
H. Nuclear regulatory requirements					7	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					14	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
Z. Other					43	
Subtotal	104	41	0	1523	356	4
Total		145			1883	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		18
14. Safety Systems		7
15. Reactor Cooling Systems		74
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	41	38
32. Feedwater and Main Steam System		109
41. Main Generator Systems		8
42. Electrical Power Supply Systems		30
XX. Miscellaneous Systems		4
Total	41	289

# US-397 COLUMBIA

Operator: ENERGYNW (Energy Northwest)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1107.0 MW(e)

Design Net Capacity: 1100.0 MW(e)

Design Discharge Burnup: 42000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9497.3 GW(e)·h

Energy Availability Factor: 100.0%

Load Factor: 97.9%

Operating Factor: 100.0%

Energy Unavailability Factor: 0.0%

Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	840.1	745.4	835.9	811.6	777.2	799.5	820.1	598.2	800.6	828.1	804.1	836.6	9497.3
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	102.0	100.2	101.6	101.8	94.4	100.3	99.6	72.6	100.4	100.5	100.7	101.6	97.9
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Aug 1972      Lifetime Generation: 216035.1 GW(e)·h

Date of First Criticality: 19 Jan 1984      Cumulative Energy Availability Factor: 79.2%

Date of Grid Connection: 27 May 1984      Cumulative Load Factor: 73.7%

Date of Commercial Operation: 13 Dec 1984      Cumulative Unit Capability Factor: 79.9%

   Cumulative Energy Unavailability Factor: 20.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	410.4	1104	90.5	90.5	90.5	90.5	84.6	84.6	399	90.7
1985	5176.4	1100	77.1	77.7	77.1	77.7	53.7	55.2	6624	75.6
1986	5183.2	1095	74.1	76.0	74.1	76.0	54.0	54.6	6133	70.0
1987	5398.0	1095	67.9	73.3	67.9	73.3	56.3	55.2	5979	68.3
1988	6000.4	1095	68.2	72.1	68.2	72.1	62.4	56.9	6020	68.5
1989	6127.9	1095	76.1	72.9	76.1	72.9	63.9	58.3	6680	76.3
1990	5791.3	1095	65.3	71.6	65.3	71.6	60.4	58.7	5752	65.7
1991	4272.5	1090	47.1	68.2	47.1	68.2	44.7	56.7	4194	47.9
1992	5705.4	1085	62.0	67.4	62.0	67.4	59.9	57.1	5505	62.7
1993	7142.0	1107	77.2	68.5	77.2	68.5	73.6	58.9	6757	77.1
1994	6753.8	1086	73.7	69.0	73.7	69.0	71.0	60.1	6500	74.2
1995	6948.0	1091	76.0	69.6	76.0	69.6	72.7	61.3	6680	76.3
1996	5562.6	1106	79.7	70.5	68.3	69.5	57.2	60.9	5999	68.3
1997	6129.9	1107	77.4	71.0	71.3	69.7	63.2	61.1	6248	71.3
1998	6922.8	1107	72.8	71.1	72.8	69.9	71.4	61.8	6373	72.8
1999	6099.7	1107	68.5	71.0	68.5	69.8	62.9	61.9	6018	68.7
2000	8605.2	1107	95.4	72.5	95.4	71.4	88.5	63.6	8385	95.5
2001	8257.7	1107	86.1	73.3	86.1	72.3	85.2	64.9	7553	86.2
2002	8981.3	1107	97.4	74.6	97.4	73.7	92.6	66.4	8528	97.4
2003	7614.9	1107	80.4	74.9	80.4	74.0	78.5	67.0	7039	80.4
2004	8981.6	1107	93.6	75.9	93.6	75.0	92.4	68.3	8222	93.6
2005	8242.3	1108	86.1	76.4	86.1	75.5	84.9	69.1	7537	86.0
2006	9328.3	1131	97.8	77.4	97.8	76.6	94.2	70.3	8568	97.8
2007	8108.6	1131	85.4	77.7	85.4	77.0	81.8	70.8	7481	85.4

2008	9269.6	1131	97.8	78.6	97.8	77.9	93.3	71.7	8592	97.8
2009	6634.0	1131	72.9	78.4	72.9	77.7	67.0	71.6	6382	72.9
2010	9241.1	1131	100.0	79.2	100.0	78.5	93.3	72.4	8760	100.0
2011	4806.3	1131	52.0	78.2	51.0	77.5	48.5	71.5	4466	51.0
2012	9333.7	1107	97.3	78.9	97.3	78.2	96.0	72.4	8545	97.3
2013	8460.9	1107	87.7	79.2	87.7	78.5	87.2	72.9	7678	87.6
2014	9497.3	1107	100.0	79.9	100.0	79.2	97.9	73.7	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					274	
C. Inspection, maintenance or repair combined with refuelling				1083		
D. Inspection, maintenance or repair without refuelling				108		
E. Testing of plant systems or components				20	1	
H. Nuclear regulatory requirements					115	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						49
L. Human factor related					16	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				60		2
Z. Other					24	
Subtotal	0	0	0	1271	430	51
Total	0			1752		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		2
14. Safety Systems		14
15. Reactor Cooling Systems		30
17. Safety I&C Systems (excluding reactor I&C)		24
31. Turbine and auxiliaries		81
32. Feedwater and Main Steam System		34
35. All other I&C Systems		4
41. Main Generator Systems		1
42. Electrical Power Supply Systems		63
Total	0	269

# US-445 COMANCHE PEAK-1

**Operator:** LUMINANT (Luminant Generation Company LLC)  
**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1209.0 MW(e)  
**Design Net Capacity:** 1150.0 MW(e)  
**Design Discharge Burnup:** 40000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 8976.7 GW(e)·h  
**Energy Availability Factor:** 84.5%  
**Load Factor:** 84.8%  
**Operating Factor:** 84.5%  
**Energy Unavailability Factor:** 15.5%  
**Total Off-line Time:** 1359 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	786.0	833.7	919.8	889.1	914.1	881.0	905.8	904.0	877.1	93.5	53.3	919.3	8976.7
<b>EAF (%)</b>	90.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	11.3	12.3	100.0	84.5
<b>UCF (%)</b>	90.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	11.3	12.3	100.0	84.5
<b>LF (%)</b>	87.4	102.6	102.4	102.1	101.6	101.2	100.7	100.5	100.8	10.4	6.1	102.2	84.8
<b>OF (%)</b>	91.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	11.3	12.3	100.0	84.5
<b>EUf (%)</b>	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.7	87.7	0.0	15.5
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.7	87.7	0.0	14.8
<b>UCLF (%)</b>	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 19 Dec 1974  
**Date of First Criticality:** 03 Apr 1990  
**Date of Grid Connection:** 24 Apr 1990  
**Date of Commercial Operation:** 13 Aug 1990

**Lifetime Generation:** 216024.4 GW(e)·h  
**Cumulative Energy Availability Factor:** 89.7%  
**Cumulative Load Factor:** 86.5%  
**Cumulative Unit Capability Factor:** 89.7%  
**Cumulative Energy Unavailability Factor:** 10.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1990	2513.5	1140	80.6	80.6	80.6	80.6	60.2	60.2	2865	78.0
1991	5360.5	1150	60.5	66.4	60.5	66.4	53.2	55.3	5341	61.0
1992	6937.5	1150	79.1	71.7	79.1	71.7	68.7	60.8	6947	79.1
1993	7150.4	1150	79.1	73.9	79.1	73.9	71.0	63.8	6932	79.1
1994	9367.6	1150	98.8	79.5	98.8	79.5	93.0	70.4	8653	98.8
1995	7803.7	1150	85.0	80.5	85.0	80.5	77.5	71.7	7444	85.0
1996	7756.2	1150	83.0	80.9	82.7	80.9	76.8	72.5	7265	82.7
1997	9478.9	1150	98.8	83.3	98.8	83.3	94.1	75.4	8656	98.8
1998	8506.0	1150	89.6	84.1	89.6	84.0	84.4	76.5	7848	89.6
1999	8601.5	1150	90.4	84.7	90.4	84.7	85.4	77.4	7922	90.4
2000	9619.8	1150	100.0	86.2	100.0	86.2	95.2	79.1	8784	100.0
2001	8444.3	1150	88.9	86.4	88.9	86.4	83.8	79.5	7781	88.8
2002	7785.3	1150	83.0	86.2	83.0	86.1	77.3	79.4	7213	82.3
2003	9626.0	1150	98.9	87.1	98.9	87.1	95.6	80.6	8653	98.8
2004	9018.1	1150	89.8	87.3	89.8	87.3	89.3	81.2	7877	89.7
2005	9217.8	1084	91.4	87.5	91.4	87.5	97.1	82.2	8004	91.4
2006	10298.0	1150	100.0	88.3	100.0	88.3	102.2	83.4	8760	100.0
2007	8596.7	1150	84.9	88.1	84.9	88.1	85.3	83.5	7437	84.9
2008	9658.7	1209	94.1	88.4	94.1	88.4	94.8	84.1	8262	94.1
2009	10640.9	1209	100.0	89.1	100.0	89.1	100.5	85.0	8760	100.0
2010	9676.7	1209	92.2	89.2	92.2	89.2	91.4	85.3	8074	92.2
2011	9667.8	1209	92.0	89.4	92.0	89.3	91.3	85.6	8056	92.0
2012	10438.1	1209	97.2	89.7	97.2	89.7	98.3	86.2	8537	97.2
2013	10028.7	1205	93.7	89.9	93.7	89.9	95.0	86.6	8211	93.7



2014	8976.7	1209	84.5	89.7	84.5	89.7	84.8	86.5	7401	84.5
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## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		67			135	
C. Inspection, maintenance or repair combined with refuelling	1292			621		
D. Inspection, maintenance or repair without refuelling				94		
L. Human factor related					13	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						6
Subtotal	1292	67	0	715	148	6
Total		1359			869	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		15
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		14
16. Steam generation systems		8
31. Turbine and auxiliaries	67	29
32. Feedwater and Main Steam System		26
35. All other I&C Systems		7
41. Main Generator Systems		14
42. Electrical Power Supply Systems		17
Total	67	130

## US-446 COMANCHE PEAK-2

**Operator:** LUMINANT (Luminant Generation Company LLC)  
**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1197.0 MW(e)  
**Design Net Capacity:** 1150.0 MW(e)  
**Design Discharge Burnup:** 36000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 9784.6 GW(e)·h  
**Energy Availability Factor:** 92.0%  
**Load Factor:** 93.3%  
**Operating Factor:** 92.0%  
**Energy Unavailability Factor:** 8.0%  
**Total Off-line Time:** 697 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	913.5	812.4	833.8	66.0	910.7	874.6	899.1	898.6	871.7	907.4	884.8	912.1	9784.6
<b>EAF (%)</b>	100.0	100.0	91.9	11.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.0
<b>UCF (%)</b>	100.0	100.0	91.9	11.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.0
<b>LF (%)</b>	102.6	101.0	93.8	7.7	102.3	101.5	101.0	100.9	101.1	101.9	102.5	102.4	93.3
<b>OF (%)</b>	100.0	100.0	91.9	11.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.0
<b>EUf (%)</b>	0.0	0.0	8.1	88.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
<b>PUf (%)</b>	0.0	0.0	8.1	88.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 19 Dec 1974  
**Date of First Criticality:** 24 Mar 1993  
**Date of Grid Connection:** 09 Apr 1993  
**Date of Commercial Operation:** 03 Aug 1993

**Lifetime Generation:** 196244.1 GW(e)·h  
**Cumulative Energy Availability Factor:** 91.8%  
**Cumulative Load Factor:** 89.9%  
**Cumulative Unit Capability Factor:** 91.8%  
**Cumulative Energy Unavailability Factor:** 8.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1993	3441.8	1150	89.7	89.7	89.7	89.7	82.8	82.8	3245	89.7
1994	5263.2	1150	65.1	72.3	65.1	72.3	52.2	61.2	5697	65.0
1995	9166.6	1150	95.7	82.0	95.7	82.0	91.0	73.5	8382	95.7
1996	7370.4	1150	79.4	81.2	78.7	81.0	73.0	73.4	6911	78.7
1997	8062.1	1150	86.2	82.4	86.2	82.2	80.0	74.9	7554	86.2
1998	9345.3	1150	99.8	85.6	99.8	85.4	92.8	78.2	8741	99.8
1999	8756.0	1150	90.2	86.3	90.2	86.2	86.9	79.5	7901	90.2
2000	8868.0	1150	90.2	86.8	90.2	86.7	87.8	80.7	7927	90.2
2001	9877.9	1150	99.7	88.4	99.7	88.3	98.1	82.7	8731	99.7
2002	8793.8	1150	90.1	88.5	90.1	88.5	87.3	83.2	7888	90.0
2003	8123.4	1150	83.8	88.1	83.8	88.0	80.6	83.0	7307	83.4
2004	10038.9	1150	100.0	89.1	100.0	89.1	99.4	84.4	8784	100.0
2005	9225.4	1124	91.1	89.3	91.1	89.2	93.7	85.1	7979	91.1
2006	9598.2	1150	94.3	89.7	94.3	89.6	95.3	85.9	8260	94.3
2007	10249.0	1150	100.0	90.4	100.0	90.3	101.7	87.0	8760	100.0
2008	9575.9	1150	93.8	90.6	93.8	90.6	94.8	87.5	8241	93.8
2009	9500.6	1158	93.2	90.8	93.2	90.7	93.7	87.9	8155	93.1
2010	10531.7	1158	100.0	91.3	100.0	91.3	103.8	88.8	8760	100.0
2011	9751.6	1197	92.7	91.4	92.7	91.3	93.0	89.0	8099	92.5
2012	9588.7	1197	91.4	91.4	91.4	91.3	91.2	89.2	8027	91.4
2013	10588.1	1195	99.6	91.8	99.6	91.8	101.1	89.8	8721	99.5
2014	9784.6	1197	92.0	91.8	92.0	91.8	93.3	89.9	8063	92.0

### 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1993 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					142	
C. Inspection, maintenance or repair combined with refuelling	697			463		
D. Inspection, maintenance or repair without refuelling				61		
E. Testing of plant systems or components				47		
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						19
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				9		
Z. Other					1	
Subtotal	697	0	0	580	143	19
Total		697			742	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1993 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		1
14. Safety Systems		31
15. Reactor Cooling Systems		41
16. Steam generation systems		6
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		34
41. Main Generator Systems		4
42. Electrical Power Supply Systems		3
XX. Miscellaneous Systems		2
Total	0	138

# US-315 COOK-1

**Operator:** AEP (American Electric Power Company, Inc.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1030.0 MW(e)  
**Design Net Capacity:** 1030.0 MW(e)  
**Design Discharge Burnup:** 38000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 8296.8 GW(e)·h  
**Energy Availability Factor:** 91.0%  
**Load Factor:** 92.0%  
**Operating Factor:** 91.0%  
**Energy Unavailability Factor:** 9.0%  
**Total Off-line Time:** 786 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	812.1	727.1	797.0	763.8	785.4	745.4	767.5	760.9	511.4	163.2	651.6	811.4	8296.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	76.7	24.7	91.9	100.0	91.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	76.7	24.7	91.9	100.0	91.0
<b>LF (%)</b>	106.0	105.0	104.1	103.0	102.5	100.5	100.2	99.3	69.0	21.3	87.7	105.9	92.0
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	76.7	24.7	92.0	100.0	91.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.3	75.3	8.1	0.0	9.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.3	75.3	0.0	0.0	8.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	0.0	0.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 25 Mar 1969  
**Date of First Criticality:** 18 Jan 1975  
**Date of Grid Connection:** 10 Feb 1975  
**Date of Commercial Operation:** 28 Aug 1975

**Lifetime Generation:** 240060.5 GW(e)·h  
**Cumulative Energy Availability Factor:** 70.6%  
**Cumulative Load Factor:** 68.0%  
**Cumulative Unit Capability Factor:** 70.7%  
**Cumulative Energy Unavailability Factor:** 29.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	2557.1	848	84.7	84.7	84.7	84.7	83.4	83.4	3141	85.5
1976	6804.9	983	79.2	80.6	79.2	80.6	78.8	80.0	7298	83.1
1977	4785.8	1044	52.4	68.2	52.4	68.2	52.3	67.9	6658	76.0
1978	6286.9	1044	68.7	68.4	68.7	68.4	68.7	68.1	6438	73.5
1979	5660.2	1044	61.9	66.9	61.9	66.9	61.9	66.7	5666	64.7
1980	6461.3	1044	79.5	69.3	74.8	68.4	70.5	67.4	6470	73.7
1981	6781.5	1044	77.1	70.5	77.1	69.8	74.2	68.5	6663	76.1
1982	5352.7	1044	64.2	69.6	64.2	69.0	58.5	67.1	5487	62.6
1983	5286.7	1030	64.3	69.0	64.3	68.4	58.6	66.1	5628	64.2
1984	7550.8	1020	91.3	71.4	91.3	70.9	84.3	68.0	8016	91.3
1985	2116.1	1020	29.9	67.4	29.9	66.9	23.7	63.8	2489	28.4
1986	6650.1	1020	85.5	69.0	85.5	68.6	74.4	64.7	7464	85.2
1987	5033.8	1020	68.2	68.9	68.2	68.5	56.3	64.0	5917	67.5
1988	7467.8	1020	95.5	70.9	95.5	70.5	83.3	65.5	8379	95.4
1989	5433.0	1020	69.9	70.8	69.9	70.5	60.8	65.2	6069	69.3
1990	6301.6	1020	79.2	71.4	79.2	71.1	70.5	65.5	6939	79.2
1991	7338.2	1013	86.0	72.3	86.0	72.0	82.7	66.5	7524	85.9
1992	4990.7	1008	65.1	71.9	65.1	71.6	56.3	66.0	5690	64.8
1993	8759.4	1006	100.0	73.4	100.0	73.1	99.3	67.7	8760	100.0
1994	5759.5	1000	71.0	73.2	71.0	73.0	65.7	67.6	6214	70.9
1995	5396.8	1000	66.4	72.9	66.4	72.7	61.6	67.4	5809	66.3
1996	8373.3	1000	97.6	74.0	97.6	73.8	95.3	68.6	8574	97.6
1997	4545.9	1000	52.4	73.1	52.4	72.9	51.9	67.9	4608	52.6
1998	0.0	1000	0.0	70.0	0.0	69.8	0.0	65.1	0	0.0

1999	0.0	1000	0.0	67.2	0.0	67.0	0.0	62.4	0	0.0
2000	129.8	1000	2.8	64.7	2.8	64.5	1.5	60.1	242	2.8
2001	7797.9	1000	90.6	65.7	89.5	65.4	89.0	61.1	7840	89.5
2002	7740.9	1000	88.9	66.5	88.9	66.3	88.4	62.1	7782	88.8
2003	6570.1	1000	74.1	66.8	74.1	66.6	75.0	62.6	6489	74.1
2004	8831.5	1000	97.7	67.8	97.7	67.6	100.5	63.8	8588	97.8
2005	8055.8	1016	90.7	68.6	90.7	68.4	90.5	64.7	7940	90.6
2006	7296.2	1016	82.9	69.0	82.9	68.8	82.0	65.3	7256	82.8
2007	9252.7	1009	99.6	70.0	99.6	69.8	104.7	66.5	8728	99.6
2008	5639.7	1009	61.6	69.7	61.6	69.5	63.6	66.4	5407	61.6
2009	263.4	1009	3.3	67.8	3.3	67.6	3.0	64.6	289	3.3
2010	7806.9	1009	89.7	68.4	89.7	68.2	88.3	65.2	7859	89.7
2011	7716.4	1009	88.1	68.9	88.1	68.8	87.3	65.8	7716	88.1
2012	9224.6	1045	100.0	69.8	100.0	69.6	100.5	66.8	8784	100.0
2013	7850.1	1030	85.3	70.2	85.3	70.1	87.0	67.3	7470	85.3
2014	8296.8	1030	91.0	70.7	91.0	70.6	92.0	68.0	7974	91.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		58			473	
C. Inspection, maintenance or repair combined with refuelling	727			1076		
D. Inspection, maintenance or repair without refuelling				115		
E. Testing of plant systems or components				8	5	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				2		
H. Nuclear regulatory requirements					742	
L. Human factor related					10	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
P. Fire					12	
Z. Other					1	2
Subtotal	727	58	0	1201	1243	6
Total		785			2450	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		16
14. Safety Systems		7
15. Reactor Cooling Systems		32
16. Steam generation systems		6
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		327
32. Feedwater and Main Steam System		16
33. Circulating Water System	58	32
35. All other I&C Systems		0
41. Main Generator Systems		17
42. Electrical Power Supply Systems		14
Total	58	467

**US-316 COOK-2****Operator:** AEP (American Electric Power Company, Inc.)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1077.0 MW(e)

**Design Net Capacity:** 1100.0 MW(e)

**Design Discharge Burnup:** 48000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 9334.0 GW(e)·h

**Energy Availability Factor:** 97.1%

**Load Factor:** 98.9%

**Operating Factor:** 97.1%

**Energy Unavailability Factor:** 2.9%

**Total Off-line Time:** 255 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	836.6	752.8	833.5	805.1	827.8	787.2	751.6	797.2	777.4	821.6	505.4	837.8	9334.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	64.6	100.0	97.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	64.6	100.0	97.1
<b>LF (%)</b>	104.4	104.0	104.2	103.8	103.3	101.5	93.8	99.5	100.3	102.5	65.1	104.6	98.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	64.6	100.0	97.1
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.4	0.0	2.9
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.4	0.0	2.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 25 Mar 1969      **Lifetime Generation:** 236882.0 GW(e)·h

**Date of First Criticality:** 10 Mar 1978      **Cumulative Energy Availability Factor:** 71.9%

**Date of Grid Connection:** 22 Mar 1978      **Cumulative Load Factor:** 69.2%

**Date of Commercial Operation:** 01 Jul 1978      **Cumulative Unit Capability Factor:** 72.0%

**Cumulative Energy Unavailability Factor:** 28.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1978	3122.8	1078	65.4	65.4	65.4	65.4	65.3	65.3	3411	77.2
1979	5953.5	1082	62.8	63.7	62.8	63.7	62.8	63.7	5773	65.9
1980	6691.2	1082	80.1	70.3	74.8	68.1	70.4	66.4	6535	74.4
1981	6384.8	1082	71.2	70.5	71.2	69.0	67.4	66.6	6178	70.5
1982	6995.6	1082	77.2	72.0	77.2	70.8	73.8	68.2	6738	76.9
1983	7013.6	1071	78.3	73.1	78.3	72.2	74.8	69.4	6835	78.0
1984	5364.4	1060	59.2	71.0	59.2	70.2	57.6	67.6	5196	59.2
1985	5683.6	1060	66.9	70.5	66.9	69.8	61.2	66.8	5852	66.8
1986	4335.6	1060	61.5	69.4	61.5	68.8	46.7	64.4	5389	61.5
1987	5026.6	1060	71.4	69.6	71.4	69.1	54.1	63.4	6248	71.3
1988	2323.3	1060	30.9	66.0	30.9	65.5	25.0	59.7	2715	30.9
1989	6661.0	1060	74.4	66.7	74.4	66.2	71.7	60.8	6518	74.4
1990	4813.3	1060	55.4	65.8	55.4	65.4	51.8	60.1	4854	55.4
1991	8185.9	1065	92.2	67.8	91.5	67.3	87.7	62.1	8013	91.5
1992	1427.3	1072	20.5	64.5	20.5	64.1	15.2	58.9	1714	19.5
1993	7553.8	1070	96.6	66.6	96.6	66.2	80.6	60.3	8459	96.6
1994	3531.5	1060	54.4	65.8	54.4	65.5	38.0	58.9	4757	54.3
1995	8602.5	1060	94.5	67.4	94.5	67.1	92.6	60.8	8268	94.4
1996	8022.6	1060	87.0	68.5	87.0	68.2	86.2	62.2	7641	87.0
1997	5875.2	1060	64.9	68.3	64.9	68.0	63.3	62.2	5705	65.1
1998	0.0	1060	0.0	65.0	0.0	64.7	0.0	59.2	0	0.0
1999	0.0	1060	0.0	62.0	0.0	61.7	0.0	56.5	0	0.0
2000	4789.8	1060	51.9	61.6	51.9	61.3	51.4	56.3	4557	51.9
2001	7963.4	1060	87.8	62.7	87.8	62.4	85.8	57.5	7690	87.8

2002	7687.7	1060	83.8	63.5	83.8	63.3	82.8	58.5	7335	83.7
2003	7112.2	1060	75.5	64.0	75.5	63.7	76.6	59.2	6610	75.5
2004	7938.5	1060	84.3	64.8	84.3	64.5	85.3	60.2	7407	84.3
2005	9415.5	1077	98.2	66.0	98.2	65.8	99.8	61.7	8603	98.2
2006	8388.8	1077	88.3	66.8	88.3	66.6	88.9	62.6	7732	88.3
2007	8124.5	1060	85.3	67.4	85.3	67.2	87.5	63.5	7492	85.5
2008	9396.6	1060	98.5	68.4	98.5	68.2	100.9	64.7	8650	98.5
2009	8063.0	1060	84.9	68.9	84.9	68.7	86.8	65.4	7434	84.9
2010	7839.2	1060	83.4	69.4	83.4	69.2	84.4	66.0	7302	83.4
2011	9641.9	1077	100.0	70.3	100.0	70.1	102.2	67.1	8760	100.0
2012	8497.2	1077	89.0	70.8	89.0	70.7	89.8	67.7	7818	89.0
2013	8430.4	1077	88.0	71.3	88.0	71.2	89.3	68.4	7709	88.0
2014	9334.0	1077	97.1	72.0	97.1	71.9	98.9	69.2	8505	97.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1978 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		255			558	
C. Inspection, maintenance or repair combined with refuelling				1050		
D. Inspection, maintenance or repair without refuelling				103		
E. Testing of plant systems or components				0		
H. Nuclear regulatory requirements					626	
L. Human factor related					13	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other					12	
Subtotal	0	255	0	1153	1209	1
Total		255			2363	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1978 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		41
15. Reactor Cooling Systems		86
16. Steam generation systems		146
17. Safety I&C Systems (excluding reactor I&C)		7
31. Turbine and auxiliaries		128
32. Feedwater and Main Steam System		19
33. Circulating Water System	255	30
35. All other I&C Systems		11
41. Main Generator Systems		38
42. Electrical Power Supply Systems		38
Total	255	552

# US-298 COOPER

Operator: ENTERGY (Entergy Nuclear Operations, Inc.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 768.0 MW(e)

Design Net Capacity: 778.0 MW(e)

Design Discharge Burnup: 17349 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5915.3 GW(e)·h

Energy Availability Factor: 88.2%

Load Factor: 87.9%

Operating Factor: 88.2%

Energy Unavailability Factor: 11.8%

Total Off-line Time: 1034 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	589.7	530.9	533.8	560.5	542.1	453.8	575.9	568.4	455.6	0.0	512.0	592.7	5915.3
EAF (%)	100.0	100.0	100.0	100.0	94.0	83.2	100.0	100.0	89.4	0.0	93.4	100.0	88.2
UCF (%)	100.0	100.0	100.0	100.0	94.0	83.2	100.0	100.0	89.4	0.0	93.4	100.0	88.2
LF (%)	103.2	102.9	93.5	101.4	94.9	82.1	100.8	99.5	82.4	0.0	92.5	103.7	87.9
OF (%)	100.0	100.0	100.0	100.0	94.0	83.2	100.0	100.0	89.4	0.0	93.3	100.0	88.2
EUf (%)	0.0	0.0	0.0	0.0	6.0	16.8	0.0	0.0	10.6	100.0	6.6	0.0	11.8
PUf (%)	0.0	0.0	0.0	0.0	6.0	16.8	0.0	0.0	10.6	100.0	6.6	0.0	11.8
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jun 1968      Lifetime Generation: 200258.2 GW(e)·h

Date of First Criticality: 21 Feb 1974      Cumulative Energy Availability Factor: 77.6%

Date of Grid Connection: 10 May 1974      Cumulative Load Factor: 73.7%

Date of Commercial Operation: 01 Jul 1974      Cumulative Unit Capability Factor: 77.7%

   Cumulative Energy Unavailability Factor: 22.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	1740.5	778	100.0	100.0	100.0	100.0	50.7	50.7	3240	73.4
1975	3363.2	764	50.3	67.2	50.3	67.2	50.3	50.4	7320	83.6
1976	3642.6	764	54.3	62.0	54.3	62.0	54.3	51.9	6626	75.4
1977	4540.1	764	67.9	63.7	67.9	63.7	67.8	56.5	7546	86.1
1978	4886.8	764	73.0	65.8	73.0	65.8	73.0	60.1	7966	90.9
1979	4995.0	764	74.6	67.4	74.6	67.4	74.6	62.8	7670	87.6
1980	3787.5	764	71.6	68.0	70.6	67.9	56.4	61.8	6240	71.0
1981	3851.1	764	71.0	68.4	71.0	68.3	57.5	61.2	6239	71.2
1982	5276.1	764	84.4	70.3	84.4	70.2	78.8	63.3	7412	84.6
1983	3343.3	764	62.7	69.5	62.7	69.4	50.0	61.9	5544	63.3
1984	3470.0	764	67.6	69.3	67.1	69.2	51.7	60.9	5901	67.2
1985	1067.7	764	20.1	65.1	20.1	64.9	16.0	57.0	1884	21.5
1986	4052.1	764	74.7	65.8	74.7	65.7	60.5	57.3	6546	74.7
1987	5522.1	764	94.6	68.0	94.6	67.8	82.5	59.2	8291	94.6
1988	4200.6	764	66.5	67.8	66.5	67.7	62.6	59.4	5887	67.0
1989	4790.9	764	74.9	68.3	74.9	68.2	71.6	60.2	6594	75.3
1990	5111.4	764	78.5	68.9	78.5	68.8	76.4	61.2	6908	78.9
1991	4803.8	764	77.9	69.4	77.9	69.3	71.8	61.8	6830	78.0
1992	6227.9	764	96.0	70.9	96.0	70.8	92.8	63.4	8436	96.0
1993	3712.9	764	56.8	70.1	56.8	70.1	55.5	63.0	5041	57.5
1994	2227.3	764	33.4	68.4	33.4	68.3	33.3	61.6	3033	34.6
1995	4127.8	764	64.0	68.2	64.0	68.1	61.7	61.6	5663	64.6
1996	6338.9	764	97.2	69.5	97.2	69.4	94.5	63.1	8540	97.2
1997	5455.7	764	83.6	70.1	83.6	70.0	81.5	63.8	7336	83.7



1998	4869.9	764	74.4	70.2	74.4	70.2	72.8	64.2	6544	74.7
1999	6510.4	764	97.7	71.3	97.7	71.2	97.3	65.5	8563	97.8
2000	4735.9	764	73.1	71.4	73.1	71.3	70.6	65.7	6414	73.0
2001	5206.5	764	79.9	71.7	79.9	71.6	77.8	66.1	7009	80.0
2002	6318.2	764	96.8	72.6	96.8	72.5	94.4	67.1	8478	96.8
2003	4492.3	764	71.3	72.5	71.3	72.5	67.1	67.1	6236	71.2
2004	6171.8	764	94.6	73.3	94.6	73.2	92.0	67.9	8299	94.5
2005	5891.9	757	88.8	73.7	88.8	73.7	88.8	68.6	7774	88.7
2006	5910.5	760	89.3	74.2	89.3	74.2	88.8	69.2	7823	89.3
2007	6671.2	758	99.1	75.0	99.1	74.9	100.5	70.1	8685	99.1
2008	5964.1	770	89.1	75.4	89.1	75.3	88.5	70.7	7825	89.1
2009	5734.6	769	85.5	75.7	85.5	75.6	85.1	71.1	7494	85.5
2010	6792.9	774	100.0	76.3	100.0	76.3	100.2	71.9	8760	100.0
2011	5768.1	774	84.2	76.5	84.2	76.5	85.1	72.2	7376	84.2
2012	5822.5	768	87.2	76.8	87.2	76.8	86.3	72.6	7657	87.2
2013	6801.9	766	100.0	77.4	100.0	77.4	101.4	73.3	8760	100.0
2014	5915.3	768	88.2	77.7	88.2	77.6	87.9	73.7	7726	88.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					175	
C. Inspection, maintenance or repair combined with refuelling	867			1158		
D. Inspection, maintenance or repair without refuelling	165			127		
E. Testing of plant systems or components				1	160	
H. Nuclear regulatory requirements					9	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					7	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
P. Fire					3	
Z. Other					35	
Subtotal	1032	0	0	1286	389	1
Total	1032			1676		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		19
14. Safety Systems		6
15. Reactor Cooling Systems		11
31. Turbine and auxiliaries		76
32. Feedwater and Main Steam System		11
35. All other I&C Systems		5
41. Main Generator Systems		6
42. Electrical Power Supply Systems		10
XX. Miscellaneous Systems		18
Total	0	171

# US-346 DAVIS BESSE-1

Operator: FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)

Contractor: B&amp;W (BABCOCK &amp; WILCOX CO.)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 894.0 MW(e)

Design Net Capacity: 906.0 MW(e)

Design Discharge Burnup: 50000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5972.4 GW(e)·h

Energy Availability Factor: 73.7%

Load Factor: 76.3%

Operating Factor: 73.7%

Energy Unavailability Factor: 26.3%

Total Off-line Time: 2307 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	644.7	0.0	0.0	0.0	652.9	652.9	675.6	674.8	655.2	680.2	660.6	675.5	5972.4
EAF (%)	100.0	0.1	0.0	0.0	76.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	73.7
UCF (%)	100.0	0.1	0.0	0.0	76.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	73.7
LF (%)	96.9	0.0	0.0	0.0	98.2	101.4	101.6	101.5	101.8	102.3	102.5	101.6	76.3
OF (%)	100.0	0.1	0.0	0.0	76.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	73.7
EUf (%)	0.0	99.9	100.0	100.0	23.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.3
PUf (%)	0.0	99.9	100.0	100.0	23.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Sep 1970      Lifetime Generation: 194932.5 GW(e)·h

Date of First Criticality: 12 Aug 1977      Cumulative Energy Availability Factor: 70.5%

Date of Grid Connection: 28 Aug 1977      Cumulative Load Factor: 68.6%

Date of Commercial Operation: 31 Jul 1978      Cumulative Unit Capability Factor: 70.6%

   Cumulative Energy Unavailability Factor: 29.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1978	1306.7	906	32.6	32.6	32.6	32.6	32.7	32.7	2090	47.3
1979	3129.1	906	39.4	37.2	39.4	37.2	39.4	37.2	4139	47.2
1980	2093.6	892	35.0	36.3	35.0	36.3	26.7	33.0	3171	36.1
1981	4363.4	888	67.4	45.1	67.4	45.1	56.1	39.5	5902	67.4
1982	3218.1	874	51.5	46.5	51.5	46.5	42.0	40.1	4508	51.5
1983	4883.3	874	72.3	51.1	72.3	51.1	63.8	44.3	6389	72.9
1984	4291.6	874	62.5	52.8	62.5	52.8	55.9	46.1	5486	62.5
1985	1942.9	862	30.9	50.0	30.9	50.0	25.7	43.4	2729	31.2
1986	3.5	860	1.3	44.4	1.3	44.4	0.0	38.4	116	1.3
1987	5064.0	860	82.8	48.3	82.8	48.3	67.2	41.4	7308	83.4
1988	1164.4	860	20.3	45.7	20.3	45.7	15.4	39.0	1891	21.5
1989	7322.1	870	97.1	50.2	97.1	50.2	96.0	43.9	8506	97.1
1990	4161.5	874	55.6	50.6	55.6	50.6	54.4	44.7	4867	55.6
1991	5843.9	874	78.6	52.7	78.6	52.7	76.3	47.1	6962	79.5
1992	7650.5	877	99.5	55.9	99.5	55.9	99.3	50.7	8742	99.5
1993	6083.4	871	82.7	57.6	82.7	57.6	79.7	52.5	7246	82.7
1994	6385.0	868	86.9	59.4	86.9	59.4	84.0	54.4	7667	87.5
1995	7670.6	869	100.0	61.7	100.0	61.7	100.8	57.1	8760	100.0
1996	6456.3	872	84.8	62.9	84.8	62.9	84.3	58.5	7452	84.8
1997	7183.4	873	93.4	64.5	93.4	64.5	93.9	60.3	8184	93.4
1998	6130.7	873	85.4	65.5	82.0	65.3	80.2	61.3	7181	82.0
1999	7370.0	873	94.9	66.9	94.9	66.7	96.4	62.9	8311	94.9
2000	6770.5	876	87.0	67.8	87.0	67.6	87.9	64.0	7633	86.9
2001	7690.8	882	99.8	69.1	99.8	69.0	99.5	65.6	8738	99.7

2002	929.0	882	12.4	66.8	12.4	66.7	12.0	63.4	1081	12.3
2003	0.0	882	0.0	64.2	0.0	64.0	0.0	60.9	0	0.0
2004	5778.4	882	75.6	64.6	75.6	64.5	74.6	61.4	6628	75.5
2005	7177.4	873	92.8	65.6	92.8	65.5	93.9	62.6	8125	92.8
2006	6375.4	891	83.0	66.2	83.0	66.1	81.7	63.2	7265	82.9
2007	7705.8	879	99.4	67.4	99.4	67.3	100.1	64.5	8712	99.5
2008	6829.4	894	86.6	68.0	86.6	67.9	88.0	65.3	7621	86.8
2009	7609.6	879	95.4	68.9	95.4	68.8	98.8	66.3	8361	95.4
2010	5188.2	894	67.4	68.8	67.4	68.7	66.2	66.3	5851	66.8
2011	6339.2	894	80.1	69.2	80.1	69.1	80.9	66.8	7012	80.0
2012	7101.7	894	89.6	69.8	89.6	69.7	90.4	67.5	7868	89.6
2013	7679.2	894	96.5	70.5	96.5	70.4	98.0	68.4	8451	96.5
2014	5972.4	894	73.7	70.6	73.7	70.5	76.3	68.6	6453	73.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					693	
C. Inspection, maintenance or repair combined with refuelling	2304			1397		
D. Inspection, maintenance or repair without refuelling				245		
E. Testing of plant systems or components	2			9	1	
H. Nuclear regulatory requirements					45	
L. Human factor related					11	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						7
Z. Other					14	
Subtotal	2306	0	0	1651	764	7
Total		2306			2422	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		89
12. Reactor I&C Systems		57
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems		51
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		396
35. All other I&C Systems		2
41. Main Generator Systems		1
42. Electrical Power Supply Systems		70
XX. Miscellaneous Systems		1
Total	0	689

# US-275 DIABLO CANYON-1

Operator: PG&amp;E (Pacific Gas and Electric Company)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1122.0 MW(e)  
 Design Net Capacity: 1084.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8556.9 GW(e)·h  
 Energy Availability Factor: 87.4%  
 Load Factor: 87.1%  
 Operating Factor: 87.4%  
 Energy Unavailability Factor: 12.6%  
 Total Off-line Time: 1108 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	847.3	214.9	148.0	829.9	837.9	826.8	850.1	849.4	801.5	841.9	817.2	692.1	8556.9
EAF (%)	100.0	28.6	24.9	100.0	98.7	100.0	100.0	100.0	98.7	100.0	100.0	93.1	87.4
UCF (%)	100.0	28.6	24.9	100.0	98.7	100.0	100.0	100.0	98.7	100.0	100.0	93.1	87.4
LF (%)	101.5	28.5	17.7	102.7	100.4	102.3	101.8	101.7	99.2	100.9	101.0	82.9	87.1
OF (%)	100.0	28.6	24.9	100.0	98.7	100.0	100.0	100.0	98.8	100.0	100.0	93.1	87.4
EUUF (%)	0.0	71.4	75.1	0.0	1.3	0.0	0.0	0.0	1.3	0.0	0.0	6.9	12.6
PUF (%)	0.0	71.4	41.8	0.0	1.3	0.0	0.0	0.0	1.3	0.0	0.0	6.9	9.8
UCLF (%)	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 23 Apr 1968      Lifetime Generation: 244696.0 GW(e)·h  
 Date of First Criticality: 29 Apr 1984      Cumulative Energy Availability Factor: 87.2%  
 Date of Grid Connection: 11 Nov 1984      Cumulative Load Factor: 86.3%  
 Date of Commercial Operation: 07 May 1985      Cumulative Unit Capability Factor: 87.3%  
    Cumulative Energy Unavailability Factor: 12.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	5234.2	1073	90.8	90.8	90.8	90.8	85.1	85.1	5206	90.8
1986	5316.2	1073	65.7	75.7	65.7	75.7	56.6	67.8	5757	65.7
1987	8284.2	1073	95.3	83.0	95.3	83.0	88.1	75.5	8340	95.2
1988	5276.1	1073	34.6	69.8	34.6	69.8	56.0	70.1	5555	63.2
1989	7199.9	1073	80.7	72.1	80.7	72.1	76.6	71.5	7069	80.7
1990	8713.5	1073	96.2	76.4	96.2	76.4	92.7	75.3	8425	96.2
1991	7366.3	1073	80.4	77.0	80.4	77.0	78.4	75.7	7125	81.3
1992	7454.7	1073	82.3	77.7	82.3	77.7	79.1	76.2	7224	82.2
1993	9028.0	1073	98.5	80.1	98.5	80.1	96.0	78.5	8630	98.5
1994	7372.0	1073	79.9	80.1	79.9	80.1	78.4	78.5	6991	79.8
1995	7451.8	1073	81.9	80.2	81.9	80.2	79.3	78.5	7175	81.9
1996	8786.8	1073	94.7	81.5	94.7	81.5	93.2	79.8	8316	94.7
1997	8195.0	1073	87.9	82.0	87.9	82.0	87.2	80.4	7700	87.9
1998	8967.8	1073	97.8	83.1	97.8	83.1	95.4	81.5	8564	97.8
1999	8224.8	1073	90.3	83.6	88.7	83.5	87.5	81.9	7764	88.6
2000	7853.5	1073	85.2	83.7	85.2	83.6	83.3	82.0	7485	85.2
2001	9504.6	1087	99.4	84.7	99.4	84.6	100.0	83.1	8708	99.4
2002	7048.2	1087	76.0	84.2	76.0	84.1	74.0	82.6	6652	75.9
2003	9585.4	1087	100.0	85.0	100.0	85.0	100.7	83.5	8760	100.0
2004	7233.9	1087	78.2	84.7	78.2	84.6	75.8	83.1	6869	78.2
2005	8323.4	1087	88.8	84.9	88.8	84.8	87.4	83.4	7775	88.8
2006	9945.0	1122	100.0	85.6	100.0	85.5	101.2	84.2	8760	100.0
2007	8868.3	1122	89.9	85.8	89.9	85.7	90.2	84.5	7870	89.8
2008	9884.2	1122	100.0	86.4	100.0	86.4	100.3	85.2	8784	100.0

2009	8237.6	1122	83.3	86.3	83.3	86.2	83.8	85.1	7295	83.3
2010	8677.4	1122	88.5	86.4	88.5	86.3	88.3	85.2	7753	88.5
2011	9916.8	1122	100.0	86.9	100.0	86.9	100.9	85.9	8760	100.0
2012	8295.7	1122	84.8	86.8	84.8	86.8	84.2	85.8	7450	84.8
2013	9653.5	1122	98.2	87.2	98.2	87.2	98.2	86.2	8606	98.2
2014	8556.9	1122	87.4	87.3	87.4	87.2	87.1	86.3	7652	87.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		247			181	
C. Inspection, maintenance or repair combined with refuelling	790			784		
D. Inspection, maintenance or repair without refuelling	70			66		
E. Testing of plant systems or components				0	1	
H. Nuclear regulatory requirements					1	
L. Human factor related					9	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
P. Fire					2	
Z. Other					4	
Subtotal	860	247	0	850	198	4
Total		1107			1052	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		4
14. Safety Systems		5
15. Reactor Cooling Systems	247	6
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		93
33. Circulating Water System		8
35. All other I&C Systems		1
41. Main Generator Systems		2
42. Electrical Power Supply Systems		43
XX. Miscellaneous Systems		1
Total	247	177

## US-323 DIABLO CANYON-2

Operator: PG&amp;E (Pacific Gas and Electric Company)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1118.0 MW(e)  
 Design Net Capacity: 1106.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8499.4 GW(e)·h  
 Energy Availability Factor: 88.4%  
 Load Factor: 86.8%  
 Operating Factor: 88.4%  
 Energy Unavailability Factor: 11.6%  
 Total Off-line Time: 1018 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	753.6	577.9	826.5	818.6	845.9	802.8	820.9	693.0	812.9	97.8	609.0	840.5	8499.4
EAF (%)	100.0	79.7	100.0	100.0	100.0	99.2	99.1	87.9	100.0	12.9	81.8	100.0	88.4
UCF (%)	100.0	79.7	100.0	100.0	100.0	99.2	99.1	87.9	100.0	12.9	81.8	100.0	88.4
LF (%)	90.6	76.9	99.5	101.7	101.7	99.7	98.7	83.3	101.0	11.8	75.6	101.1	86.8
OF (%)	100.0	79.8	100.0	100.0	100.0	99.2	99.1	87.9	100.0	12.9	81.8	100.0	88.4
EUf (%)	0.0	20.3	0.0	0.0	0.0	0.8	0.9	12.1	0.0	87.1	18.2	0.0	11.6
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.8	0.9	0.0	0.0	87.1	18.2	0.0	9.0
UCLF (%)	0.0	20.3	0.0	0.0	0.0	0.0	0.0	12.1	0.0	0.0	0.0	0.0	2.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 09 Dec 1970      Lifetime Generation: 241161.6 GW(e)·h  
 Date of First Criticality: 19 Aug 1985      Cumulative Energy Availability Factor: 88.9%  
 Date of Grid Connection: 20 Oct 1985      Cumulative Load Factor: 86.9%  
 Date of Commercial Operation: 13 Mar 1986      Cumulative Unit Capability Factor: 89.0%  
    Cumulative Energy Unavailability Factor: 11.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	6548.2	1080	95.4	95.4	95.4	95.4	86.2	86.2	6729	95.4
1987	5728.8	1079	65.4	78.8	65.4	78.8	60.6	72.0	5752	65.7
1988	6243.3	1087	69.3	75.4	69.3	75.4	65.4	69.6	6086	69.3
1989	8616.0	1087	92.2	79.8	92.2	79.8	90.5	75.1	8072	92.1
1990	7578.1	1087	83.2	80.5	83.2	80.5	79.6	76.1	7284	83.2
1991	7718.5	1087	84.7	81.2	84.7	81.2	81.1	76.9	7420	84.7
1992	9247.7	1087	98.5	83.8	98.5	83.8	96.9	79.9	8651	98.5
1993	7796.2	1087	83.6	83.8	83.6	83.8	81.9	80.1	7324	83.6
1994	7896.1	1087	85.0	83.9	85.0	83.9	82.9	80.4	7439	84.9
1995	8821.0	1087	96.3	85.2	96.3	85.2	92.6	81.7	8430	96.2
1996	7932.9	1087	85.0	85.1	85.0	85.1	83.1	81.8	7459	84.9
1997	8883.5	1087	96.4	86.1	96.4	86.1	93.3	82.8	8441	96.4
1998	8159.0	1087	87.1	86.2	87.1	86.2	85.7	83.0	7624	87.0
1999	8443.7	1087	91.3	86.5	90.2	86.5	88.7	83.4	7902	90.2
2000	9188.5	1087	96.9	87.2	96.9	87.2	96.2	84.3	8512	96.9
2001	8658.4	1087	91.9	87.5	91.9	87.5	90.9	84.7	8051	91.9
2002	9286.1	1087	99.6	88.3	98.9	88.2	97.5	85.5	8663	98.9
2003	7725.2	1087	82.5	87.9	82.5	87.8	81.1	85.2	7225	82.5
2004	8017.9	1087	85.8	87.8	85.8	87.7	84.0	85.2	7535	85.8
2005	9441.7	1087	100.0	88.4	100.0	88.3	99.1	85.9	8760	100.0
2006	8529.6	1087	88.3	88.4	88.3	88.3	89.6	86.0	7734	88.3
2007	9720.1	1118	100.0	89.0	100.0	88.9	99.2	86.7	8760	100.0
2008	7263.1	1118	75.7	88.4	74.9	88.3	74.0	86.1	6578	74.9
2009	7998.2	1118	86.4	88.3	86.4	88.2	81.7	85.9	7565	86.4

2010	9752.5	1118	100.0	88.8	100.0	88.7	99.6	86.5	8760	100.0
2011	8751.6	1118	88.9	88.8	88.9	88.7	89.4	86.6	7789	88.9
2012	9474.8	1118	98.8	89.2	98.0	89.0	96.5	87.0	8609	98.0
2013	8428.3	1118	85.6	89.0	85.6	88.9	86.0	86.9	7499	85.6
2014	8499.4	1118	88.4	89.0	88.4	88.9	86.8	86.9	7742	88.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		226			160	
C. Inspection, maintenance or repair combined with refuelling	779			699		
D. Inspection, maintenance or repair without refuelling	12			13		
E. Testing of plant systems or components				1		
L. Human factor related					10	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						20
Z. Other					12	
Subtotal	791	226	0	713	182	20
Total	1017			915		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		6
15. Reactor Cooling Systems		5
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		31
33. Circulating Water System		1
35. All other I&C Systems		7
41. Main Generator Systems		8
42. Electrical Power Supply Systems	226	72
Total	226	157

## US-237 DRESDEN-2

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 894.0 MW(e)

Design Net Capacity: 794.0 MW(e)

Design Discharge Burnup: 47000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7585.9 GW(e)·h

Energy Availability Factor: 95.0%

Load Factor: 96.9%

Operating Factor: 94.9%

Energy Unavailability Factor: 5.0%

Total Off-line Time: 445 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	673.0	628.1	694.3	305.7	595.5	658.4	677.3	679.2	657.9	649.0	676.8	690.7	7585.9
EAF (%)	100.0	100.0	100.0	47.9	91.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.0
UCF (%)	100.0	100.0	100.0	47.9	91.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.0
LF (%)	101.2	104.6	104.5	47.5	89.5	102.3	101.8	102.1	102.2	97.6	105.0	103.8	96.9
OF (%)	100.0	100.0	100.0	47.2	91.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.9
EUf (%)	0.0	0.0	0.0	52.1	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	52.1	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 10 Jan 1966      Lifetime Generation: 224694.5 GW(e)·h

Date of First Criticality: 07 Jan 1970      Cumulative Energy Availability Factor: 79.9%

Date of Grid Connection: 13 Apr 1970      Cumulative Load Factor: 71.4%

Date of Commercial Operation: 09 Jun 1970      Cumulative Unit Capability Factor: 80.0%

   Cumulative Energy Unavailability Factor: 20.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1970	1002.0	804	100.0	100.0	100.0	100.0	23.9	23.9	1945	37.9
1971	2806.3	815	100.0	100.0	100.0	100.0	39.3	33.6	5694	65.0
1972	3370.5	815	100.0	100.0	100.0	100.0	47.1	38.8	5240	59.7
1973	5014.5	800	90.8	97.5	90.8	97.5	71.6	47.8	7672	87.6
1974	3376.0	800	58.3	89.0	58.3	89.0	48.2	47.9	5113	58.4
1975	2957.0	800	42.2	80.7	42.2	80.7	42.2	46.9	4826	55.1
1976	4374.4	781	64.1	78.3	64.1	78.3	63.8	49.4	6660	75.8
1977	3538.1	772	52.4	75.0	52.4	75.0	52.3	49.8	6297	71.9
1978	5704.5	772	84.4	76.0	84.4	76.0	84.4	53.7	8244	94.1
1979	4942.9	772	73.1	75.7	73.1	75.7	73.1	55.6	7141	81.5
1980	4580.4	772	93.5	77.4	93.5	77.4	67.5	56.7	8193	93.3
1981	3416.0	772	60.7	76.0	60.1	75.9	50.5	56.2	5260	60.0
1982	5123.1	772	93.0	77.3	92.4	77.2	75.8	57.7	8094	92.4
1983	3402.2	772	59.2	76.0	58.9	75.9	50.3	57.2	5076	57.9
1984	4468.4	772	72.9	75.8	72.9	75.7	65.9	57.8	6402	72.9
1985	3106.0	772	54.5	74.4	54.5	74.3	45.9	57.0	4678	53.4
1986	4655.7	772	77.2	74.6	77.2	74.5	68.8	57.7	6761	77.2
1987	3362.6	772	61.0	73.8	61.0	73.8	49.7	57.3	5342	61.0
1988	4325.2	772	78.9	74.1	78.9	74.0	63.8	57.6	6931	78.9
1989	4751.7	772	80.2	74.4	80.2	74.3	70.3	58.3	7023	80.2
1990	4116.9	772	67.6	74.1	67.6	74.0	60.9	58.4	5920	67.6
1991	2984.2	772	58.0	73.4	58.0	73.3	44.1	57.7	5031	57.4
1992	4185.8	772	84.5	73.8	84.5	73.8	61.7	57.9	7419	84.5
1993	3058.6	772	54.7	73.0	54.7	73.0	45.2	57.4	4790	54.7



1994	4086.1	772	66.3	72.8	66.3	72.7	60.4	57.5	5808	66.3
1995	1890.5	772	33.5	71.3	33.5	71.2	28.0	56.4	2938	33.5
1996	2161.4	772	42.5	70.2	42.5	70.1	31.9	55.4	3731	42.5
1997	5578.4	772	89.4	70.9	89.4	70.8	82.5	56.4	7738	88.3
1998	5632.9	772	85.6	71.4	85.6	71.3	83.3	57.4	7496	85.6
1999	6229.5	772	92.7	72.1	92.7	72.0	92.1	58.5	8122	92.7
2000	6867.4	772	99.6	73.0	99.6	72.9	101.3	59.9	8747	99.6
2001	6072.7	772	91.2	73.6	91.2	73.5	89.8	60.8	8005	91.4
2002	7527.5	850	100.0	74.4	100.0	74.4	101.1	62.2	8760	100.0
2003	6703.1	850	92.0	75.0	92.0	75.0	90.0	63.1	7999	91.3
2004	5909.3	850	80.2	75.2	80.2	75.1	79.1	63.6	7045	80.2
2005	6590.1	850	88.0	75.6	88.0	75.5	88.5	64.3	7710	88.0
2006	7273.2	867	96.9	76.2	96.9	76.2	95.8	65.3	8485	96.9
2007	6972.7	867	92.8	76.7	92.8	76.6	91.8	66.1	8132	92.8
2008	7469.5	867	98.4	77.3	98.4	77.3	98.1	67.0	8639	98.3
2009	6902.6	867	91.7	77.7	91.7	77.7	90.9	67.6	8033	91.7
2010	7726.9	867	100.0	78.3	100.0	78.3	101.7	68.5	8760	100.0
2011	7181.3	883	93.1	78.7	93.1	78.7	94.3	69.2	8150	93.0
2012	7912.8	883	98.3	79.2	98.3	79.2	102.0	70.1	8634	98.3
2013	7546.8	883	94.4	79.6	94.4	79.5	97.6	70.8	8266	94.3
2014	7585.9	894	95.0	80.0	95.0	79.9	96.9	71.4	8315	94.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		444			536	
C. Inspection, maintenance or repair combined with refuelling				1136		
D. Inspection, maintenance or repair without refuelling				59		
E. Testing of plant systems or components				10	38	
H. Nuclear regulatory requirements					3	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					16	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Z. Other					8	0
Subtotal	0	444	0	1205	601	3
Total		444			1809	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		63
12. Reactor I&C Systems		66
13. Reactor Auxiliary Systems		9
14. Safety Systems		20
15. Reactor Cooling Systems		90
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		128
32. Feedwater and Main Steam System		27
35. All other I&C Systems		18
41. Main Generator Systems	64	45
42. Electrical Power Supply Systems	380	23
XX. Miscellaneous Systems		41
Total	444	531

## US-249 DRESDEN-3

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 879.0 MW(e)  
 Design Net Capacity: 794.0 MW(e)  
 Design Discharge Burnup: 47000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7549.8 GW(e)·h  
 Energy Availability Factor: 95.5%  
 Load Factor: 98.0%  
 Operating Factor: 95.4%  
 Energy Unavailability Factor: 4.5%  
 Total Off-line Time: 399 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	699.5	630.0	690.5	664.4	671.2	655.8	682.0	674.4	638.8	589.0	261.6	692.7	7549.8
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	45.5	100.0	95.5
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	45.5	100.0	95.5
LF (%)	107.0	106.7	105.7	105.0	102.6	103.6	104.3	103.1	100.9	90.1	41.3	105.9	98.0
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	44.7	100.0	95.4
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.5	0.0	4.5
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.5	0.0	4.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 14 Oct 1966      Lifetime Generation: 217064.9 GW(e)·h  
 Date of First Criticality: 12 Jan 1971      Cumulative Energy Availability Factor: 77.0%  
 Date of Grid Connection: 22 Jul 1971      Cumulative Load Factor: 71.3%  
 Date of Commercial Operation: 16 Nov 1971      Cumulative Unit Capability Factor: 77.0%  
    Cumulative Energy Unavailability Factor: 23.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1971	590.0	794	100.0	100.0	100.0	100.0	49.4	49.4	814	55.6
1972	5175.6	815	100.0	100.0	100.0	100.0	72.3	69.0	7549	85.9
1973	3703.6	800	69.2	85.9	69.2	85.9	52.8	61.6	5905	67.4
1974	3608.9	800	65.8	79.6	65.8	79.6	51.5	58.5	5778	66.0
1975	2211.2	800	31.5	68.2	31.5	68.2	31.6	52.0	4505	51.4
1976	4037.2	781	58.7	66.4	58.7	66.4	58.8	53.3	7231	82.3
1977	5186.4	773	76.6	68.0	76.6	68.0	76.6	57.0	8072	92.1
1978	3835.3	773	56.6	66.4	56.6	66.4	56.6	56.9	6280	71.7
1979	3482.9	773	51.4	64.6	51.4	64.6	51.4	56.3	5930	67.7
1980	4335.5	773	72.3	65.5	72.3	65.5	63.9	57.1	6307	71.8
1981	5177.7	773	95.1	68.3	94.5	68.3	76.5	59.0	8256	94.2
1982	3896.4	773	64.3	68.0	63.8	67.9	57.5	58.8	5562	63.5
1983	4159.7	773	73.1	68.4	73.1	68.3	61.4	59.1	6401	73.1
1984	2135.5	773	37.7	66.1	37.7	66.0	31.5	57.0	3309	37.7
1985	4401.3	773	75.6	66.8	75.6	66.7	65.0	57.5	6618	75.5
1986	1498.3	773	28.1	64.2	28.1	64.2	22.1	55.2	2456	28.0
1987	4395.5	773	75.3	64.9	75.3	64.8	64.9	55.8	6591	75.2
1988	4168.4	773	71.5	65.3	71.5	65.2	61.4	56.1	6278	71.5
1989	5119.5	773	82.6	66.2	82.6	66.2	75.6	57.2	7235	82.6
1990	5149.8	773	83.0	67.1	83.0	67.0	76.1	58.2	7272	83.0
1991	2584.2	773	59.9	66.7	59.9	66.7	38.2	57.2	5247	59.9
1992	3077.1	773	61.1	66.5	61.1	66.4	45.3	56.6	5364	61.1
1993	4969.0	773	80.4	67.1	80.4	67.1	73.4	57.4	7040	80.4
1994	1666.4	773	34.3	65.7	34.3	65.7	24.6	56.0	3009	34.3

1995	3477.3	773	59.5	65.4	59.5	65.4	51.4	55.8	5209	59.5
1996	2962.1	773	48.9	64.8	48.9	64.7	43.6	55.3	4273	48.6
1997	4046.2	773	68.6	64.9	68.6	64.9	59.8	55.5	5900	67.4
1998	6234.6	773	93.1	66.0	93.1	65.9	92.1	56.8	8157	93.1
1999	6130.0	773	91.1	66.8	91.1	66.8	90.5	58.0	7978	91.1
2000	6365.1	773	93.8	67.8	93.8	67.7	93.7	59.2	8243	93.8
2001	6466.0	773	95.4	68.7	95.4	68.6	95.5	60.4	8359	95.4
2002	6060.9	850	90.5	69.4	90.5	69.4	87.3	61.3	7915	90.4
2003	6963.9	850	94.2	70.2	94.2	70.2	93.5	62.4	8206	93.7
2004	6436.9	850	85.9	70.7	85.9	70.7	86.2	63.2	7544	85.9
2005	7032.4	850	93.3	71.5	93.3	71.4	94.4	64.2	8169	93.2
2006	7171.9	867	94.7	72.2	94.7	72.2	94.4	65.1	8298	94.7
2007	7558.1	867	99.5	73.0	99.5	73.0	99.5	66.2	8715	99.5
2008	6919.1	867	92.4	73.6	92.4	73.6	90.9	66.9	8118	92.4
2009	7364.8	867	97.7	74.3	97.7	74.2	97.0	67.7	8557	97.7
2010	6866.2	867	92.2	74.8	92.2	74.7	90.4	68.4	8076	92.2
2011	7533.0	867	100.0	75.5	100.0	75.4	99.2	69.2	8760	100.0
2012	6892.7	867	93.7	75.9	93.7	75.9	90.5	69.8	8218	93.6
2013	7870.0	867	98.1	76.5	98.1	76.5	103.6	70.6	8590	98.0
2014	7549.8	879	95.5	77.0	95.5	77.0	98.0	71.3	8361	95.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					570	
C. Inspection, maintenance or repair combined with refuelling	398			1179		
D. Inspection, maintenance or repair without refuelling				97		
E. Testing of plant systems or components				1	7	
H. Nuclear regulatory requirements					1	
L. Human factor related					20	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				1		
Z. Other					14	
Subtotal	398	0	0	1278	612	1
Total		398			1891	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		16
13. Reactor Auxiliary Systems		2
14. Safety Systems		47
15. Reactor Cooling Systems		48
17. Safety I&C Systems (excluding reactor I&C)		56
31. Turbine and auxiliaries		171
32. Feedwater and Main Steam System		54
33. Circulating Water System		5
35. All other I&C Systems		1
41. Main Generator Systems		13
42. Electrical Power Supply Systems		78
XX. Miscellaneous Systems		68
Total	0	565

# US-331 DUANE ARNOLD-1

Operator: NEXTERA (NextEra Energy Resources, LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 601.0 MW(e)  
 Design Net Capacity: 538.0 MW(e)  
 Design Discharge Burnup: 27800 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4152.5 GW(e)·h  
 Energy Availability Factor: 85.4%  
 Load Factor: 78.9%  
 Operating Factor: 85.4%  
 Energy Unavailability Factor: 14.6%  
 Total Off-line Time: 1278 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	455.0	406.6	454.3	437.8	440.7	427.1	428.4	417.8	389.6	31.4	32.8	231.0	4152.5
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.9	15.8	100.0	85.4
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.9	15.8	100.0	85.4
LF (%)	101.8	100.7	101.7	101.2	98.6	98.7	95.8	93.4	90.0	7.0	7.6	51.7	78.9
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.8	15.8	100.0	85.4
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.1	84.2	0.0	14.6
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.1	84.2	0.0	14.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 22 Jun 1970      Lifetime Generation: 146653.1 GW(e)·h  
 Date of First Criticality: 23 Mar 1974      Cumulative Energy Availability Factor: 80.5%  
 Date of Grid Connection: 19 May 1974      Cumulative Load Factor: 76.8%  
 Date of Commercial Operation: 01 Feb 1975      Cumulative Unit Capability Factor: 80.6%  
    Cumulative Energy Unavailability Factor: 19.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	2099.6	515	79.4	79.4	79.4	79.4	50.9	50.9	6298	78.6
1976	2489.4	515	55.1	66.7	55.1	66.7	55.0	53.0	6847	77.9
1977	2897.8	515	64.3	65.9	64.3	65.9	64.2	56.9	6908	78.9
1978	1227.5	515	27.2	56.0	27.2	56.0	27.2	49.3	2902	33.1
1979	2898.9	515	64.3	57.7	64.3	57.7	64.3	52.3	6830	78.0
1980	2796.3	515	74.8	60.6	73.2	60.3	61.8	53.9	6456	73.5
1981	2219.5	515	69.3	61.8	69.3	61.6	49.2	53.3	6108	69.7
1982	2280.4	515	74.2	63.4	74.2	63.2	50.5	52.9	6543	74.7
1983	2324.3	515	61.8	63.2	61.8	63.0	51.5	52.8	5503	62.8
1984	2717.6	515	72.2	64.1	72.2	64.0	60.1	53.5	6402	72.9
1985	1940.5	515	52.6	63.1	52.6	62.9	43.0	52.5	4711	53.8
1986	3192.8	515	81.5	64.6	81.5	64.5	70.8	54.1	7495	85.6
1987	2546.6	515	62.0	64.4	62.0	64.3	56.4	54.3	5513	62.9
1988	3520.2	520	72.3	65.0	72.3	64.9	77.0	55.9	7128	81.1
1989	3143.6	536	62.5	64.8	62.5	64.7	66.9	56.7	6561	74.9
1990	3021.0	538	74.7	65.5	74.7	65.4	64.1	57.2	6498	74.2
1991	4146.8	532	93.9	67.2	93.9	67.1	88.9	59.1	8217	93.8
1992	3434.6	515	80.5	67.9	80.5	67.8	75.9	60.0	7112	81.0
1993	3241.4	515	76.6	68.4	76.5	68.3	71.8	60.6	6755	77.1
1994	4108.4	515	92.0	69.6	92.0	69.5	91.1	62.2	8078	92.2
1995	3737.0	515	82.4	70.2	82.4	70.1	82.8	63.1	7253	82.8
1996	3938.5	520	89.9	71.1	89.9	71.0	86.2	64.2	7906	90.0
1997	4155.5	520	92.7	72.0	92.7	71.9	91.2	65.4	8125	92.8
1998	3839.2	520	85.2	72.6	85.2	72.5	84.3	66.2	7477	85.4

1999	3649.0	520	83.0	73.0	83.0	72.9	80.1	66.7	7267	83.0
2000	4455.7	520	97.4	73.9	97.4	73.9	97.5	67.9	8553	97.4
2001	3860.6	565	85.4	74.4	85.4	74.3	84.1	68.5	7473	85.3
2002	4581.1	565	95.1	75.2	93.6	75.0	92.7	69.5	8147	93.0
2003	3998.6	565	83.8	75.5	83.8	75.4	80.8	69.9	7209	82.3
2004	4929.9	565	97.9	76.3	97.9	76.2	99.3	71.0	8596	97.9
2005	4544.5	562	90.0	76.8	90.0	76.7	92.3	71.7	7882	90.0
2006	5095.4	581	98.9	77.5	98.9	77.4	100.1	72.7	8664	98.9
2007	4518.9	580	86.7	77.8	86.7	77.7	88.9	73.2	7598	86.7
2008	5282.8	580	100.0	78.6	100.0	78.5	103.7	74.2	8784	100.0
2009	4678.9	579	90.1	78.9	90.1	78.8	92.2	74.8	7891	90.1
2010	4454.4	601	85.8	79.1	85.8	79.0	84.6	75.1	7471	85.3
2011	5215.2	601	98.3	79.7	98.3	79.6	99.1	75.8	8611	98.3
2012	4347.0	601	84.2	79.9	84.2	79.8	82.3	76.0	7391	84.1
2013	5320.8	601	100.0	80.4	100.0	80.3	101.1	76.7	8760	100.0
2014	4152.5	601	85.4	80.6	85.4	80.5	78.9	76.8	7482	85.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					365	
C. Inspection, maintenance or repair combined with refuelling	1277			812		
D. Inspection, maintenance or repair without refuelling				248		
E. Testing of plant systems or components				21	20	
H. Nuclear regulatory requirements					31	
L. Human factor related					40	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
Z. Other					18	0
Subtotal	1277	0	0	1081	474	3
Total	1277			1558		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		10
14. Safety Systems		14
15. Reactor Cooling Systems		202
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System		30
35. All other I&C Systems		1
41. Main Generator Systems		9
42. Electrical Power Supply Systems		18
XX. Miscellaneous Systems		25
Total	0	358

# US-348 FARLEY-1

**Operator:** SOUTHERN (Southern Nuclear Operating Company, Inc.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 874.0 MW(e)  
**Design Net Capacity:** 829.0 MW(e)  
**Design Discharge Burnup:** 33000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 7777.4 GW(e)·h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 101.6%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	666.8	600.5	664.5	642.3	654.8	631.8	656.1	653.7	634.4	662.3	645.1	665.2	7777.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>LF (%)</b>	102.5	102.2	102.3	102.1	100.7	100.4	100.9	100.5	100.8	101.9	102.4	102.3	101.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1970 **Lifetime Generation:** 225864.6 GW(e)·h  
**Date of First Criticality:** 09 Aug 1977 **Cumulative Energy Availability Factor:** 84.8%  
**Date of Grid Connection:** 18 Aug 1977 **Cumulative Load Factor:** 83.4%  
**Date of Commercial Operation:** 01 Dec 1977 **Cumulative Unit Capability Factor:** 85.0%  
**Cumulative Energy Unavailability Factor:** 15.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	395.9	820	100.0	100.0	100.0	100.0	64.2	64.2	512	68.8
1978	5919.8	829	81.5	83.0	81.5	83.0	81.5	80.2	7568	86.4
1979	1732.4	829	23.9	54.6	23.9	54.6	23.9	53.2	2502	28.6
1980	4607.8	814	74.4	61.0	70.2	59.6	64.4	56.8	6110	69.6
1981	2653.0	804	41.5	56.3	41.5	55.3	37.7	52.2	3624	41.4
1982	5233.3	804	79.3	60.7	79.3	59.9	74.3	56.5	6936	79.2
1983	5268.6	804	77.7	63.5	77.7	62.8	74.8	59.4	6832	78.0
1984	5432.7	804	78.5	65.6	78.5	65.0	76.9	61.9	6920	78.8
1985	5868.7	816	84.3	67.9	84.3	67.4	82.1	64.4	7378	84.2
1986	5738.6	827	82.4	69.5	82.4	69.1	79.2	66.1	7247	82.7
1987	6444.9	825	93.7	72.0	93.7	71.5	89.2	68.4	8201	93.6
1988	5908.2	813	83.8	73.0	83.8	72.6	82.7	69.7	7363	83.8
1989	6022.6	824	86.0	74.1	86.0	73.8	83.4	70.8	7520	85.8
1990	6908.6	824	99.1	76.0	99.1	75.7	95.7	72.7	8681	99.1
1991	5416.1	814	78.9	76.2	78.4	75.9	76.0	73.0	6870	78.4
1992	5667.9	812	81.0	76.6	81.0	76.2	79.5	73.4	7119	81.0
1993	6873.9	812	97.3	77.8	97.3	77.5	96.6	74.8	8522	97.3
1994	6059.8	812	86.1	78.3	86.1	78.0	85.2	75.4	7546	86.1
1995	5752.0	812	82.4	78.5	82.4	78.3	80.9	75.7	7220	82.4
1996	7142.3	812	99.5	79.6	99.5	79.4	100.1	77.0	8740	99.5
1997	5434.0	821	77.7	79.5	77.7	79.3	75.5	76.9	6803	77.7
1998	5237.9	822	74.8	79.3	74.8	79.1	72.7	76.7	6539	74.6
1999	7226.5	847	99.3	80.2	99.3	80.0	97.4	77.7	8695	99.3
2000	5204.1	828	76.8	80.1	76.8	79.9	71.6	77.4	6775	77.1

2001	6392.5	833	88.3	80.4	88.3	80.3	87.6	77.9	7736	88.3
2002	7221.8	833	98.7	81.2	98.7	81.0	99.0	78.7	8641	98.6
2003	6609.9	830	90.3	81.5	90.3	81.4	90.9	79.2	7909	90.3
2004	6423.9	851	87.0	81.7	87.0	81.6	86.8	79.5	7627	86.8
2005	7402.2	833	99.4	82.4	99.4	82.2	101.4	80.3	8709	99.4
2006	6419.3	851	86.5	82.5	86.5	82.4	86.1	80.5	7578	86.5
2007	6530.8	851	87.5	82.7	87.5	82.5	87.6	80.7	7663	87.5
2008	7281.5	851	97.7	83.2	97.7	83.1	97.4	81.3	8579	97.7
2009	6711.1	851	90.5	83.4	90.5	83.3	90.0	81.6	7922	90.4
2010	6577.4	851	89.1	83.6	89.1	83.5	88.2	81.8	7806	89.1
2011	7764.3	874	100.0	84.1	100.0	84.0	101.4	82.4	8760	100.0
2012	6929.4	874	90.7	84.3	90.7	84.2	90.3	82.6	7967	90.7
2013	7021.4	874	91.7	84.5	91.7	84.4	91.7	82.9	8033	91.7
2014	7777.4	874	100.0	85.0	100.0	84.8	101.6	83.4	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					200	
C. Inspection, maintenance or repair combined with refuelling				986		
D. Inspection, maintenance or repair without refuelling				56		
E. Testing of plant systems or components				1	0	
H. Nuclear regulatory requirements					20	
L. Human factor related					12	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
Z. Other					2	
Subtotal	0	0	0	1043	234	4
Total	0			1281		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		0
14. Safety Systems		3
15. Reactor Cooling Systems		7
16. Steam generation systems		13
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		91
32. Feedwater and Main Steam System		15
35. All other I&C Systems		1
41. Main Generator Systems		4
42. Electrical Power Supply Systems		47
XX. Miscellaneous Systems		1
Total	0	193

## US-364 FARLEY-2

**Operator:** SOUTHERN (Southern Nuclear Operating Company, Inc.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 883.0 MW(e)  
**Design Net Capacity:** 829.0 MW(e)  
**Design Discharge Burnup:** 33000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6728.0 GW(e)·h  
**Energy Availability Factor:** 88.1%  
**Load Factor:** 87.0%  
**Operating Factor:** 88.1%  
**Energy Unavailability Factor:** 11.9%  
**Total Off-line Time:** 1042 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	581.7	602.7	660.9	642.6	619.7	633.4	651.8	655.1	631.7	243.9	216.1	588.4	6728.0
<b>EAF (%)</b>	89.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	42.4	37.0	89.5	88.1
<b>UCF (%)</b>	89.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	42.4	37.0	89.5	88.1
<b>LF (%)</b>	88.5	101.6	100.7	101.1	94.3	99.6	99.2	99.7	99.4	37.1	33.9	89.6	87.0
<b>OF (%)</b>	89.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	42.5	37.0	89.5	88.1
<b>EUf (%)</b>	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.6	63.0	10.5	11.9
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.9	63.0	0.0	8.7
<b>UCLF (%)</b>	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.6	0.0	10.5	3.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1970 **Lifetime Generation:** 212122.0 GW(e)·h  
**Date of First Criticality:** 05 May 1981 **Cumulative Energy Availability Factor:** 88.2%  
**Date of Grid Connection:** 25 May 1981 **Cumulative Load Factor:** 86.1%  
**Date of Commercial Operation:** 30 Jul 1981 **Cumulative Unit Capability Factor:** 88.2%  
**Cumulative Energy Unavailability Factor:** 11.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	2920.8	825	95.3	95.3	95.3	95.3	80.1	80.1	3665	83.0
1982	5311.3	814	79.4	84.8	79.4	84.8	74.5	76.4	6931	79.1
1983	5984.1	814	87.7	86.0	87.7	86.0	83.9	79.4	7696	87.9
1984	6618.9	814	94.4	88.4	94.2	88.3	92.6	83.1	8276	94.2
1985	5474.2	809	77.8	86.1	77.4	85.9	77.2	81.8	6813	77.8
1986	5959.9	829	85.2	85.9	85.2	85.8	82.1	81.9	7455	85.1
1987	4910.4	824	73.0	83.9	73.0	83.8	68.0	79.7	6396	73.0
1988	6550.4	823	100.0	86.1	100.0	86.0	90.6	81.2	8039	91.5
1989	5621.6	830	80.5	85.4	80.5	85.3	77.3	80.7	7037	80.3
1990	5277.0	828	71.8	84.0	71.8	83.9	72.8	79.9	6478	73.9
1991	6739.9	824	96.0	85.1	95.6	85.0	93.4	81.2	8376	95.6
1992	5409.9	824	79.5	84.6	79.5	84.5	74.7	80.6	6987	79.5
1993	5248.5	822	75.8	83.9	75.8	83.8	72.9	80.0	6644	75.8
1994	7147.2	822	98.9	85.0	98.9	84.9	99.3	81.4	8660	98.9
1995	5091.4	822	79.7	84.7	79.7	84.6	70.7	80.7	6984	79.7
1996	5741.3	822	81.5	84.4	81.5	84.4	79.5	80.6	7160	81.5
1997	7280.9	822	100.0	85.4	100.0	85.3	101.1	81.8	8760	100.0
1998	6271.4	824	85.8	85.4	85.8	85.4	86.8	82.1	7514	85.8
1999	5356.2	852	82.7	85.3	82.7	85.2	71.8	81.6	7242	82.7
2000	7362.6	839	99.4	86.0	99.4	85.9	99.9	82.5	8736	99.5
2001	5777.7	842	79.0	85.7	79.0	85.6	78.3	82.3	6921	79.0
2002	6463.4	842	87.7	85.8	87.7	85.7	87.6	82.6	7682	87.7
2003	7379.4	839	99.2	86.4	99.2	86.3	100.4	83.4	8687	99.2
2004	6724.1	849	90.5	86.5	90.5	86.5	90.7	83.7	7949	90.5



2005	6351.7	842	86.4	86.5	86.4	86.5	86.1	83.8	7566	86.4
2006	7620.3	860	100.0	87.1	100.0	87.0	101.2	84.5	8760	100.0
2007	6572.1	860	87.5	87.1	87.5	87.1	87.2	84.6	7660	87.4
2008	6795.5	860	90.5	87.2	90.5	87.2	90.0	84.8	7956	90.6
2009	7262.5	860	96.2	87.5	96.2	87.5	96.4	85.2	8427	96.2
2010	6592.2	860	87.7	87.6	87.7	87.5	87.5	85.3	7682	87.7
2011	6666.9	860	89.4	87.6	89.4	87.6	88.5	85.4	7826	89.3
2012	7833.6	883	100.0	88.0	100.0	88.0	101.0	85.9	8784	100.0
2013	7076.6	883	92.9	88.2	92.9	88.2	91.5	86.1	8142	92.9
2014	6728.0	883	88.1	88.2	88.1	88.2	87.0	86.1	7718	88.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		276			137	
C. Inspection, maintenance or repair combined with refuelling	766			806		
D. Inspection, maintenance or repair without refuelling				32		
E. Testing of plant systems or components				6		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					11	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					0	
Z. Other					1	0
Subtotal	766	276	0	844	149	1
Total		1042			994	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems	81	15
13. Reactor Auxiliary Systems	116	7
14. Safety Systems		16
15. Reactor Cooling Systems	78	37
16. Steam generation systems		21
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		12
32. Feedwater and Main Steam System		10
35. All other I&C Systems		0
41. Main Generator Systems		4
42. Electrical Power Supply Systems		5
Total	275	130

# US-341 FERMI-2

Operator: DTEDISON (DETROIT EDISON CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1122.0 MW(e)  
 Design Net Capacity: 1093.0 MW(e)  
 Design Discharge Burnup: 19404 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 7809.5 GW(e)·h  
 Energy Availability Factor: 84.7%  
 Load Factor: 79.5%  
 Operating Factor: 83.5%  
 Energy Unavailability Factor: 15.3%  
 Total Off-line Time: 1449 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	758.4	203.9	0.0	424.5	835.1	803.4	833.0	831.3	675.6	824.3	829.9	790.0	7809.5
EAF (%)	100.0	39.1	7.6	66.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	84.7
UCF (%)	100.0	39.1	7.6	66.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	84.7
LF (%)	90.9	27.0	0.0	52.6	100.0	99.5	99.8	99.6	83.6	98.7	102.6	94.6	79.5
OF (%)	100.0	34.1	0.0	63.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.5
EUf (%)	0.0	60.9	92.4	33.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.3
PUf (%)	0.0	60.9	92.4	33.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 26 Sep 1972      Lifetime Generation: 190937.9 GW(e)·h  
 Date of First Criticality: 21 Jun 1985      Cumulative Energy Availability Factor: 79.2%  
 Date of Grid Connection: 21 Sep 1986      Cumulative Load Factor: 75.3%  
 Date of Commercial Operation: 23 Jan 1988      Cumulative Unit Capability Factor: 79.2%  
    Cumulative Energy Unavailability Factor: 20.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	4060.1	1093	57.0	57.0	57.0	57.0	45.0	45.0	4719	57.2
1989	5230.7	1093	63.4	60.3	63.4	60.3	54.6	50.0	5575	63.6
1990	7118.3	1059	82.3	67.6	82.3	67.6	76.7	58.9	7266	82.9
1991	6180.9	1059	72.8	68.9	72.8	68.9	66.6	60.8	6466	73.8
1992	7356.8	1060	79.1	71.0	79.1	71.0	79.0	64.5	7019	79.9
1993	8284.7	1085	92.1	74.6	92.1	74.6	87.2	68.3	8076	92.2
1994	0.0	1085	0.0	63.7	0.0	63.7	0.0	58.4	0	0.0
1995	5132.0	997	71.7	64.7	71.7	64.7	58.7	58.4	6509	74.3
1996	4790.0	876	58.2	64.1	58.2	64.1	62.3	58.8	5859	66.7
1997	5579.9	1000	70.5	64.7	70.5	64.7	63.6	59.3	5461	62.3
1998	7146.8	1098	78.4	66.0	78.4	66.0	74.3	60.7	6868	78.4
1999	9484.7	1081	99.3	68.9	99.3	68.9	100.1	64.1	8698	99.3
2000	8237.8	1083	85.7	70.2	85.7	70.2	86.6	65.9	7514	85.5
2001	8564.0	1089	89.3	71.6	89.3	71.6	89.8	67.7	7837	89.5
2002	9302.9	1089	98.5	73.5	98.5	73.5	97.5	69.7	8630	98.5
2003	8127.8	1089	85.3	74.2	85.3	74.2	85.2	70.7	7479	85.4
2004	8453.1	1089	88.2	75.1	88.2	75.1	88.4	71.8	7764	88.4
2005	8767.6	1111	90.8	76.0	90.8	76.0	90.1	72.9	7955	90.8
2006	7497.3	1101	80.9	76.3	80.9	76.3	77.7	73.1	7095	81.0
2007	8318.4	1122	86.1	76.8	86.1	76.8	84.6	73.7	7542	86.1
2008	9614.3	1122	99.1	77.9	99.1	77.9	97.6	74.9	8706	99.1
2009	7424.7	1122	78.3	77.9	78.3	77.9	75.5	75.0	6855	78.3
2010	7743.3	1106	87.1	78.3	87.1	78.3	79.9	75.2	7373	84.2
2011	8916.7	1085	95.1	79.0	95.1	79.0	93.5	76.0	8334	95.1

2012	5176.5	1037	63.4	78.4	63.4	78.4	56.8	75.2	5562	63.3
2013	6609.5	1037	92.0	78.9	92.0	78.9	72.8	75.1	8063	92.0
2014	7809.5	1122	84.7	79.2	84.7	79.2	79.5	75.3	7311	83.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					907	
C. Inspection, maintenance or repair combined with refuelling	1282			628		
D. Inspection, maintenance or repair without refuelling	166			215		
J. Grid limitation, failure or grid unavailability						14
L. Human factor related					7	
P. Fire					0	
Subtotal	1448	0	0	843	914	14
Total	1448			1771		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		29
12. Reactor I&C Systems		18
13. Reactor Auxiliary Systems		45
14. Safety Systems		11
15. Reactor Cooling Systems		21
17. Safety I&C Systems (excluding reactor I&C)		15
31. Turbine and auxiliaries		367
32. Feedwater and Main Steam System		34
33. Circulating Water System		2
35. All other I&C Systems		12
41. Main Generator Systems		220
42. Electrical Power Supply Systems		81
XX. Miscellaneous Systems		45
Total	0	900

# US-333 FITZPATRICK

Operator: ENTERGY (Entergy Nuclear Operations, Inc.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 813.0 MW(e)

Design Net Capacity: 821.0 MW(e)

Design Discharge Burnup: 31800 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5828.7 GW(e)·h

Energy Availability Factor: 87.1%

Load Factor: 81.8%

Operating Factor: 87.1%

Energy Unavailability Factor: 12.9%

Total Off-line Time: 1133 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	607.6	522.5	576.1	569.5	590.9	451.5	513.8	364.6	0.0	389.0	614.1	629.1	5828.7
EAF (%)	100.0	100.0	100.0	100.0	100.0	90.9	100.0	76.5	0.0	76.9	100.0	100.0	87.1
UCF (%)	100.0	100.0	100.0	100.0	100.0	90.9	100.0	76.5	0.0	76.9	100.0	100.0	87.1
LF (%)	100.4	95.6	95.4	97.3	97.7	77.1	84.9	60.3	0.0	64.3	104.8	104.0	81.8
OF (%)	100.0	100.0	100.0	100.0	100.0	90.8	100.0	76.5	0.0	76.9	100.0	100.0	87.1
EUf (%)	0.0	0.0	0.0	0.0	0.0	9.1	0.0	23.5	100.0	23.1	0.0	0.0	12.9
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.5	100.0	23.1	0.0	0.0	12.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Sep 1968      Lifetime Generation: 212075.2 GW(e)·h

Date of First Criticality: 17 Nov 1974      Cumulative Energy Availability Factor: 79.3%

Date of Grid Connection: 01 Feb 1975      Cumulative Load Factor: 76.2%

Date of Commercial Operation: 28 Jul 1975      Cumulative Unit Capability Factor: 79.5%

   Cumulative Energy Unavailability Factor: 20.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	1824.1	819	100.0	100.0	100.0	100.0	50.3	50.3	3230	73.1
1976	4156.4	670	70.5	81.7	70.5	81.7	70.6	62.9	6284	71.5
1977	3893.4	770	57.7	71.8	57.7	71.8	57.7	60.7	5986	68.3
1978	4197.4	800	59.9	68.2	59.9	68.2	59.9	60.5	6311	72.0
1979	2964.7	800	42.3	62.2	42.3	62.2	42.3	56.3	4450	50.8
1980	4334.1	802	71.0	63.9	70.4	63.7	61.5	57.3	6162	70.2
1981	4779.7	810	74.7	65.6	74.7	65.5	67.4	58.9	6539	74.6
1982	4959.7	810	75.3	66.9	75.3	66.9	69.9	60.4	6570	75.0
1983	4634.3	810	70.7	67.4	70.7	67.3	65.3	61.0	6183	70.6
1984	4899.4	810	76.9	68.4	76.9	68.3	68.9	61.8	6745	76.8
1985	4166.5	810	64.1	68.0	64.1	67.9	58.7	61.5	5576	63.7
1986	6015.6	797	90.5	70.0	90.5	69.9	86.1	63.7	7931	90.5
1987	4198.3	795	67.1	69.7	67.1	69.7	60.3	63.4	5891	67.2
1988	4356.9	780	66.5	69.5	66.5	69.5	63.5	63.4	5844	66.5
1989	6155.3	757	90.3	70.9	90.3	70.8	92.8	65.4	7944	90.7
1990	4601.9	782	68.4	70.7	68.4	70.7	67.2	65.5	6045	69.0
1991	3376.8	780	56.0	69.8	56.0	69.8	49.4	64.5	4534	51.8
1992	0.0	780	0.0	65.9	0.0	65.8	0.0	60.9	0	0.0
1993	4746.5	780	71.6	66.2	71.6	66.1	69.5	61.3	6301	71.9
1994	4972.6	774	81.9	67.0	81.9	66.9	73.3	61.9	7224	82.5
1995	4804.0	777	71.6	67.2	71.6	67.2	70.5	62.3	6336	72.3
1996	5290.4	765	79.3	67.7	79.3	67.7	78.6	63.1	7036	80.1
1997	6624.6	799	96.3	69.0	94.9	68.9	94.6	64.5	8310	94.9
1998	4930.5	785	75.2	69.3	75.2	69.2	71.7	64.8	6613	75.5

1999	6567.4	799	93.5	70.3	93.5	70.2	93.7	66.0	8205	93.7
2000	6024.8	813	86.6	71.0	86.6	70.9	84.4	66.8	7617	86.7
2001	7090.5	813	98.6	72.0	98.6	72.0	99.6	68.0	8639	98.6
2002	6595.0	813	92.4	72.8	92.4	72.7	92.6	69.0	8112	92.6
2003	6966.0	813	96.2	73.6	96.2	73.6	97.8	70.0	8435	96.3
2004	6455.9	813	90.8	74.2	90.8	74.2	90.4	70.7	7984	90.9
2005	7052.3	825	95.9	75.0	95.9	74.9	97.6	71.6	8403	95.9
2006	6758.7	852	92.6	75.6	92.6	75.5	90.6	72.3	8108	92.6
2007	6918.4	852	97.8	76.3	95.0	76.2	92.7	72.9	8318	95.0
2008	6691.0	852	92.3	76.8	92.3	76.7	89.4	73.5	8105	92.3
2009	7398.1	854	100.0	77.5	100.0	77.4	98.9	74.3	8760	100.0
2010	6361.5	855	90.3	77.9	90.3	77.8	84.9	74.6	7908	90.3
2011	7244.0	855	100.0	78.6	100.0	78.4	96.7	75.2	8760	100.0
2012	6070.5	813	85.8	78.8	85.8	78.6	85.0	75.5	7536	85.8
2013	6839.8	813	97.7	79.3	97.7	79.1	96.0	76.0	8557	97.7
2014	5828.7	813	87.1	79.5	87.1	79.3	81.8	76.2	7627	87.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		65			357	
C. Inspection, maintenance or repair combined with refuelling	1066			1009		
D. Inspection, maintenance or repair without refuelling				205		
E. Testing of plant systems or components				2	3	
H. Nuclear regulatory requirements					116	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					47	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						9
Z. Other				3	16	
Subtotal	1066	65	0	1219	539	13
Total		1131			1771	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		21
12. Reactor I&C Systems		16
13. Reactor Auxiliary Systems		7
14. Safety Systems		70
15. Reactor Cooling Systems		46
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		17
31. Turbine and auxiliaries	65	56
32. Feedwater and Main Steam System		33
35. All other I&C Systems		5
41. Main Generator Systems		18
42. Electrical Power Supply Systems		47
XX. Miscellaneous Systems		16
Total	65	352

# US-285 FORT CALHOUN-1

Operator: OPPD (OMAHA PUBLIC POWER DISTRICT)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 482.0 MW(e)  
 Design Net Capacity: 478.0 MW(e)  
 Design Discharge Burnup: 13500 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4184.9 GW(e)·h  
 Energy Availability Factor: 97.3%  
 Load Factor: 99.1%  
 Operating Factor: 97.3%  
 Energy Unavailability Factor: 2.7%  
 Total Off-line Time: 233 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	307.2	341.7	341.1	349.0	371.0	330.7	363.4	360.7	355.1	372.2	365.7	327.1	4184.9
EAF (%)	86.4	100.0	93.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.1	97.3
UCF (%)	86.4	100.0	93.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.1	97.3
LF (%)	85.7	105.5	95.2	100.6	103.5	95.3	101.3	100.6	102.3	103.8	105.2	91.2	99.1
OF (%)	86.4	100.0	93.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.1	97.3
EUf (%)	13.6	0.0	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9	2.7
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	13.6	0.0	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9	2.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 07 Jun 1968      Lifetime Generation: 123972.2 GW(e)·h  
 Date of First Criticality: 06 Aug 1973      Cumulative Energy Availability Factor: 76.1%  
 Date of Grid Connection: 25 Aug 1973      Cumulative Load Factor: 72.2%  
 Date of Commercial Operation: 26 Sep 1973      Cumulative Unit Capability Factor: 76.1%  
    Cumulative Energy Unavailability Factor: 23.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	601.4	468	96.2	96.2	96.2	96.2	44.9	44.9	2642	90.2
1974	2416.3	457	83.5	86.7	83.5	86.7	60.4	56.5	7304	83.4
1975	2080.8	457	52.0	71.8	52.0	71.8	52.0	54.6	5905	67.4
1976	2195.5	443	56.5	67.3	56.5	67.3	56.4	55.1	6101	69.5
1977	2922.7	444	75.1	69.1	75.1	69.1	75.1	59.7	6958	79.4
1978	2849.4	456	71.4	69.5	71.4	69.5	71.3	61.9	6580	75.1
1979	3666.1	457	91.6	73.0	91.6	73.0	91.6	66.6	8382	95.7
1980	2010.3	465	59.7	71.2	59.7	71.2	49.2	64.2	5307	60.4
1981	2149.7	480	72.7	71.4	72.7	71.4	51.1	62.5	6327	72.2
1982	3482.1	478	89.8	73.4	89.8	73.4	83.2	64.8	7856	89.7
1983	2749.9	461	73.1	73.4	73.1	73.4	68.1	65.1	6404	73.1
1984	2331.8	478	60.1	72.2	60.1	72.2	55.5	64.3	5262	59.9
1985	3066.3	478	73.7	72.3	73.7	72.3	73.2	65.0	6454	73.7
1986	3605.6	478	94.3	74.0	94.3	74.0	86.1	66.6	8263	94.3
1987	3060.6	478	74.7	74.0	74.7	74.0	73.1	67.1	6531	74.6
1988	2627.4	478	74.0	74.0	74.0	74.0	62.6	66.8	6496	74.0
1989	3296.0	478	87.8	74.9	87.8	74.9	78.7	67.5	7589	86.6
1990	2417.2	478	62.1	74.1	62.1	74.1	57.7	67.0	5420	61.9
1991	3249.0	478	92.9	75.2	92.9	75.2	77.6	67.6	7946	90.7
1992	2537.1	478	64.9	74.6	64.9	74.6	60.4	67.2	5683	64.7
1993	3102.2	478	80.0	74.9	80.0	74.9	74.1	67.5	6996	79.9
1994	4118.7	478	99.5	76.1	99.5	76.1	98.4	69.0	8711	99.4
1995	3365.6	478	82.4	76.4	82.4	76.4	80.4	69.5	7204	82.2
1996	3128.7	478	78.5	76.5	78.5	76.5	74.5	69.7	6886	78.4

1997	3818.2	478	92.9	77.2	92.9	77.2	91.2	70.6	8131	92.8
1998	3396.6	478	82.2	77.4	82.2	77.4	81.1	71.1	7195	82.1
1999	3584.4	478	88.9	77.8	88.9	77.8	85.6	71.6	7785	88.9
2000	3898.1	478	93.2	78.4	93.2	78.4	92.8	72.4	8185	93.2
2001	3524.1	478	88.0	78.7	88.0	78.7	84.2	72.8	7702	87.9
2002	3808.5	478	92.1	79.2	92.1	79.2	91.0	73.4	8061	92.0
2003	3510.1	478	86.8	79.4	86.8	79.4	83.8	73.8	7596	86.7
2004	4071.3	478	96.8	80.0	96.8	80.0	97.0	74.5	8503	96.8
2005	2919.6	476	71.7	79.7	71.7	79.7	70.0	74.4	6277	71.6
2006	3100.5	478	74.8	79.6	74.8	79.6	74.0	74.4	6553	74.8
2007	4370.3	482	100.0	80.2	100.0	80.2	103.5	75.3	8760	100.0
2008	3517.2	482	81.9	80.2	81.9	80.2	83.1	75.5	7195	81.9
2009	3702.3	482	86.5	80.4	86.5	80.4	87.7	75.8	7579	86.5
2010	4261.5	478	99.0	80.9	99.0	80.9	101.8	76.5	8619	98.4
2011	1177.6	482	27.4	79.5	27.4	79.5	27.9	75.2	2346	26.8
2012	0.0	482	0.0	77.4	0.0	77.4	0.0	73.3	0	0.0
2013	95.4	482	2.8	75.6	2.8	75.6	2.3	71.5	243	2.8
2014	4184.9	482	97.3	76.1	97.3	76.1	99.1	72.2	8527	97.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1973 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		233			163	
C. Inspection, maintenance or repair combined with refuelling				1139		
D. Inspection, maintenance or repair without refuelling				65		
E. Testing of plant systems or components				23		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				152	411	
H. Nuclear regulatory requirements					4	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)						0
Z. Other				4	13	
Subtotal	0	233	0	1383	592	1
Total		233			1976	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1973 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	81	9
13. Reactor Auxiliary Systems		5
14. Safety Systems		12
15. Reactor Cooling Systems		58
16. Steam generation systems		5
31. Turbine and auxiliaries		19
32. Feedwater and Main Steam System		13
33. Circulating Water System	101	
41. Main Generator Systems	50	
42. Electrical Power Supply Systems		31
XX. Miscellaneous Systems		7
Total	232	159

# US-244 GINNA

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 580.0 MW(e)  
 Design Net Capacity: 470.0 MW(e)  
 Design Discharge Burnup: 39000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4662.5 GW(e)·h  
 Energy Availability Factor: 92.9%  
 Load Factor: 91.8%  
 Operating Factor: 92.9%  
 Energy Unavailability Factor: 7.1%  
 Total Off-line Time: 618 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	424.5	390.5	432.0	371.1	106.0	417.3	423.2	407.7	411.4	427.6	418.6	432.6	4662.5
EAF (%)	100.0	100.0	100.0	89.4	29.8	100.0	100.0	97.3	100.0	100.0	100.0	100.0	92.9
UCF (%)	100.0	100.0	100.0	89.4	29.8	100.0	100.0	97.3	100.0	100.0	100.0	100.0	92.9
LF (%)	98.4	100.2	100.3	88.9	24.6	99.9	98.1	94.5	98.5	99.1	100.1	100.3	91.8
OF (%)	100.0	100.0	100.0	89.4	29.8	100.0	100.0	97.3	100.0	100.0	100.0	100.0	92.9
EUf (%)	0.0	0.0	0.0	10.6	70.2	0.0	0.0	2.7	0.0	0.0	0.0	0.0	7.1
PUf (%)	0.0	0.0	0.0	10.6	66.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5
UCLF (%)	0.0	0.0	0.0	0.0	4.1	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 25 Apr 1966      Lifetime Generation: 161881.3 GW(e)·h  
 Date of First Criticality: 08 Nov 1969      Cumulative Energy Availability Factor: 86.0%  
 Date of Grid Connection: 02 Dec 1969      Cumulative Load Factor: 83.6%  
 Date of Commercial Operation: 01 Jul 1970      Cumulative Unit Capability Factor: 86.0%  
    Cumulative Energy Unavailability Factor: 14.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1970	1597.0	448	100.0	100.0	100.0	100.0	80.7	80.7	3868	87.6
1971	2871.8	493	100.0	100.0	100.0	100.0	66.5	71.0	6592	75.3
1972	2572.1	504	100.0	100.0	100.0	100.0	58.1	65.7	6029	68.6
1973	3398.8	490	95.0	98.6	95.0	98.6	79.2	69.5	8325	95.0
1974	2097.2	490	48.9	87.5	48.9	87.5	48.9	64.9	5465	62.4
1975	3041.1	470	73.4	85.0	73.4	85.0	73.9	66.5	6709	76.6
1976	2060.8	470	49.7	79.8	49.7	79.8	49.9	64.0	5113	58.2
1977	3028.5	470	73.6	79.0	73.6	79.0	73.6	65.3	7489	85.5
1978	3218.7	470	77.5	78.8	77.5	78.8	78.2	66.7	7058	80.6
1979	2960.5	470	71.3	78.0	71.3	78.0	71.9	67.3	6375	72.8
1980	3093.5	470	76.0	77.8	76.0	77.8	74.9	68.0	6673	76.0
1981	3322.5	470	82.2	78.2	82.2	78.2	80.7	69.1	7194	82.1
1982	2408.0	470	58.9	76.7	58.9	76.7	58.5	68.2	5150	58.8
1983	3040.1	470	74.9	76.5	74.9	76.5	73.8	68.7	6529	74.5
1984	3156.8	470	77.2	76.6	77.2	76.6	76.5	69.2	6779	77.2
1985	3620.3	470	87.9	77.3	87.9	77.3	87.9	70.4	7700	87.9
1986	3610.3	470	87.4	77.9	87.4	77.9	87.7	71.4	7659	87.4
1987	3797.7	470	91.3	78.7	91.3	78.7	92.2	72.6	7994	91.3
1988	3533.2	470	86.5	79.1	86.5	79.1	85.6	73.3	7592	86.4
1989	3073.5	470	75.0	78.9	75.0	78.9	74.6	73.4	6569	75.0
1990	3451.4	470	83.6	79.1	83.6	79.1	83.8	73.9	7325	83.6
1991	3483.3	470	86.0	79.4	86.0	79.4	84.6	74.4	7536	86.0
1992	3483.4	470	85.8	79.7	85.8	79.7	84.4	74.8	7536	85.8
1993	3499.4	470	85.7	80.0	85.7	80.0	85.0	75.2	7509	85.7



1994	3373.7	470	82.4	80.1	82.4	80.1	81.9	75.5	7219	82.4
1995	3638.6	470	88.8	80.4	88.8	80.4	88.4	76.0	7776	88.8
1996	2898.1	470	70.4	80.0	70.4	80.0	70.2	75.8	6175	70.3
1997	3894.7	480	91.7	80.5	91.7	80.5	92.6	76.4	8011	91.4
1998	4308.6	480	100.0	81.2	100.0	81.2	102.5	77.3	8760	100.0
1999	3534.1	480	85.3	81.3	85.3	81.3	84.0	77.6	7444	85.0
2000	3814.1	480	91.0	81.6	91.0	81.6	90.5	78.0	8001	91.1
2001	4286.3	480	100.0	82.2	100.0	82.2	101.9	78.8	8760	100.0
2002	3843.3	480	90.4	82.5	90.4	82.5	91.4	79.2	7951	90.8
2003	3868.6	480	90.1	82.7	90.1	82.7	92.0	79.5	7925	90.5
2004	4308.5	480	99.4	83.2	99.4	83.2	102.2	80.2	8733	99.4
2005	3996.7	498	93.3	83.5	93.3	83.5	91.6	80.5	8166	93.2
2006	4119.2	493	92.2	83.7	92.2	83.7	95.3	81.0	8157	93.1
2007	4930.5	560	99.2	84.2	99.2	84.2	100.5	81.6	8675	99.0
2008	4744.0	560	94.9	84.5	94.9	84.5	96.4	82.0	8280	94.3
2009	4630.9	580	94.9	84.8	94.9	84.8	91.1	82.3	8235	94.0
2010	4948.4	580	98.8	85.3	98.8	85.3	97.4	82.7	8654	98.8
2011	4311.2	580	86.1	85.3	86.1	85.3	84.9	82.8	7539	86.1
2012	4601.7	580	91.7	85.5	91.7	85.5	90.3	83.0	8055	91.7
2013	4993.3	581	98.9	85.8	98.9	85.8	98.1	83.4	8668	98.9
2014	4662.5	580	92.9	86.0	92.9	86.0	91.8	83.6	8142	92.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		50			183	
C. Inspection, maintenance or repair combined with refuelling	568			1007		
D. Inspection, maintenance or repair without refuelling				64		
E. Testing of plant systems or components				16	0	
H. Nuclear regulatory requirements					0	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Z. Other					7	
Subtotal	568	50	0	1087	194	1
Total		618			1282	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		2
14. Safety Systems		13
15. Reactor Cooling Systems		8
16. Steam generation systems		39
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System	20	28
33. Circulating Water System		4
35. All other I&C Systems		1
41. Main Generator Systems	30	
42. Electrical Power Supply Systems		15
XX. Miscellaneous Systems		16
Total	50	179

# US-416 GRAND GULF-1

Operator: ENTERGY (Entergy Nuclear Operations, Inc.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1419.0 MW(e)  
 Design Net Capacity: 1250.0 MW(e)  
 Design Discharge Burnup: 28000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 10279.5 GW(e)·h  
 Energy Availability Factor: 88.4%  
 Load Factor: 82.7%  
 Operating Factor: 88.4%  
 Energy Unavailability Factor: 11.6%  
 Total Off-line Time: 1016 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	1007.4	309.0	149.9	779.6	1032.8	937.4	967.1	965.4	994.4	1048.2	1035.3	1053.0	10279.5
EAF (%)	100.0	31.5	28.3	96.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.4
UCF (%)	100.0	31.6	28.3	96.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.4
LF (%)	95.4	32.4	14.2	76.3	97.8	91.8	91.6	91.4	97.3	99.3	101.2	99.7	82.7
OF (%)	100.0	31.5	28.3	96.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.4
EUf (%)	0.0	68.5	71.7	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6
PUf (%)	0.0	68.5	49.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.4
UCLF (%)	0.0	0.0	22.3	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 04 May 1974      Lifetime Generation: 272287.9 GW(e)·h  
 Date of First Criticality: 18 Aug 1982      Cumulative Energy Availability Factor: 87.1%  
 Date of Grid Connection: 20 Oct 1984      Cumulative Load Factor: 86.3%  
 Date of Commercial Operation: 01 Jul 1985      Cumulative Unit Capability Factor: 87.3%  
    Cumulative Energy Unavailability Factor: 12.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	2654.1	1108	58.7	58.7	58.7	58.7	54.2	54.2	2691	60.9
1986	4098.1	1108	60.5	59.9	60.5	59.9	42.2	46.2	5326	60.8
1987	7727.0	1130	80.9	68.4	80.9	68.4	78.0	59.1	7098	81.0
1988	9591.0	1142	93.8	75.8	93.8	75.8	95.6	69.7	8250	93.9
1989	7846.3	1142	76.9	76.0	76.9	76.0	78.4	71.7	6815	77.8
1990	7404.0	1142	76.6	76.1	76.6	76.1	74.0	72.1	6765	77.2
1991	9118.7	1142	89.6	78.2	88.4	78.0	91.1	75.0	8035	91.7
1992	8171.1	1143	81.1	78.6	81.1	78.4	81.4	75.9	7163	81.5
1993	7898.5	1143	77.6	78.5	77.6	78.3	78.9	76.2	6845	78.1
1994	9614.8	1143	94.5	80.2	94.5	80.1	96.0	78.3	8284	94.6
1995	7809.7	1153	77.7	79.9	77.7	79.8	77.3	78.2	6829	78.0
1996	9224.7	1175	87.7	80.6	87.7	80.5	89.3	79.2	7696	87.6
1997	10817.6	1200	100.0	82.3	100.0	82.2	102.9	81.2	8760	100.0
1998	9190.8	1200	87.5	82.7	87.5	82.6	87.4	81.7	7641	87.2
1999	8428.4	1204	79.3	82.4	79.3	82.3	79.9	81.6	6944	79.3
2000	10694.6	1208	99.2	83.6	98.3	83.4	100.7	82.9	8634	98.3
2001	9924.0	1210	92.3	84.1	91.8	83.9	93.6	83.5	8040	91.8
2002	10059.5	1207	93.8	84.7	92.9	84.5	95.1	84.2	8139	92.9
2003	10902.5	1207	97.9	85.4	97.9	85.2	103.1	85.3	8574	97.9
2004	10235.1	1207	91.2	85.7	91.2	85.5	96.5	85.9	8047	91.6
2005	10077.8	1263	91.7	86.0	91.1	85.8	91.1	86.2	7974	91.0
2006	10807.3	1266	97.8	86.6	97.8	86.4	97.4	86.7	8570	97.8
2007	9358.8	1268	87.3	86.7	87.3	86.5	84.3	86.6	7643	87.2
2008	9417.1	1268	87.0	86.7	87.0	86.5	84.5	86.5	7637	86.9

2009	10998.5	1259	100.0	87.3	100.0	87.1	99.7	87.1	8760	100.0
2010	9643.2	1251	90.3	87.4	90.3	87.2	88.0	87.1	7912	90.3
2011	10336.5	1251	100.0	87.9	100.0	87.7	94.3	87.4	8760	100.0
2012	7336.4	1419	67.2	87.0	67.2	86.9	63.2	86.4	5740	65.3
2013	10784.3	1419	91.2	87.2	91.2	87.1	86.7	86.4	7891	90.1
2014	10279.5	1419	88.4	87.3	88.4	87.1	82.7	86.3	7744	88.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		189			222	
C. Inspection, maintenance or repair combined with refuelling	826			677	15	
D. Inspection, maintenance or repair without refuelling				102		
E. Testing of plant systems or components				0	0	
H. Nuclear regulatory requirements					1	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					23	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						15
Z. Other					22	2
Subtotal	826	189	0	779	283	19
Total		1015			1081	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		19
14. Safety Systems		1
15. Reactor Cooling Systems	103	32
17. Safety I&C Systems (excluding reactor I&C)		10
31. Turbine and auxiliaries	85	50
32. Feedwater and Main Steam System		17
33. Circulating Water System		2
35. All other I&C Systems		4
41. Main Generator Systems		13
42. Electrical Power Supply Systems		32
XX. Miscellaneous Systems		30
Total	188	216

# US-400 HARRIS-1

Operator: PROGRESS (Progress Energy)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 928.0 MW(e)  
 Design Net Capacity: 900.0 MW(e)  
 Design Discharge Burnup: 31500 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8048.6 GW(e)·h  
 Energy Availability Factor: 97.3%  
 Load Factor: 99.0%  
 Operating Factor: 97.3%  
 Energy Unavailability Factor: 2.7%  
 Total Off-line Time: 238 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	607.0	645.6	714.4	684.4	535.8	670.3	696.6	698.5	679.0	709.0	692.3	715.7	8048.6
EAF (%)	87.3	100.0	100.0	100.0	80.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.3
UCF (%)	87.3	100.0	100.0	100.0	80.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.3
LF (%)	87.9	103.5	103.6	102.4	77.6	100.3	100.9	101.2	101.6	102.7	103.5	103.7	99.0
OF (%)	87.4	100.0	100.0	100.0	80.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.3
EUf (%)	12.7	0.0	0.0	0.0	19.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7
PUf (%)	0.0	0.0	0.0	0.0	19.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6
UCLF (%)	12.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 28 Jan 1978      Lifetime Generation: 184369.1 GW(e)·h  
 Date of First Criticality: 03 Jan 1987      Cumulative Energy Availability Factor: 88.7%  
 Date of Grid Connection: 19 Jan 1987      Cumulative Load Factor: 88.3%  
 Date of Commercial Operation: 02 May 1987      Cumulative Unit Capability Factor: 88.7%  
    Cumulative Energy Unavailability Factor: 11.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987			Data not provided							
1988	5345.6	860	73.6	73.6	73.6	73.6	70.8	70.8	6458	73.5
1989	5638.8	860	78.5	76.0	78.5	76.0	74.8	72.8	6873	78.5
1990	6339.0	860	89.2	80.4	89.2	80.4	84.1	76.6	7812	89.2
1991	5927.4	860	80.8	80.5	80.8	80.5	78.7	77.1	7080	80.8
1992	5427.9	860	74.0	79.2	74.0	79.2	71.9	76.1	6501	74.0
1993	7527.7	860	99.6	82.6	99.6	82.6	99.9	80.0	8721	99.6
1994	6065.1	860	82.2	82.5	82.2	82.5	80.5	80.1	7195	82.1
1995	5966.3	860	83.1	82.6	83.1	82.6	79.2	80.0	7279	83.1
1996	7067.7	860	95.3	84.0	94.6	83.9	93.6	81.5	8301	94.5
1997	5909.0	860	79.2	83.5	79.2	83.5	78.4	81.2	6934	79.2
1998	6711.6	860	90.1	84.1	90.1	84.1	89.1	81.9	7891	90.1
1999	7244.1	860	96.9	85.2	96.9	85.1	96.2	83.1	8484	96.8
2000	6878.0	860	92.2	85.7	92.2	85.7	91.0	83.7	8098	92.2
2001	5401.5	860	72.3	84.8	72.3	84.7	71.7	82.8	6335	72.3
2002	7835.0	900	99.0	85.8	98.7	85.7	99.4	84.0	8643	98.7
2003	7236.9	900	92.3	86.2	92.3	86.1	91.8	84.5	8082	92.3
2004	7008.4	900	87.5	86.3	87.5	86.2	88.7	84.8	7687	87.5
2005	7930.8	900	99.4	87.0	99.4	87.0	100.6	85.7	8710	99.4
2006	7029.3	900	88.5	87.1	88.5	87.1	89.2	85.9	7749	88.5
2007	7403.1	900	93.4	87.4	93.4	87.4	93.9	86.3	8176	93.3
2008	7821.4	900	97.2	87.9	97.2	87.9	98.9	86.9	8534	97.2
2009	7403.2	900	92.4	88.1	92.4	88.1	93.9	87.2	8091	92.4
2010	7080.6	900	88.4	88.1	88.4	88.1	89.8	87.3	7746	88.4

2011	8111.8	900	100.0	88.6	100.0	88.6	102.9	88.0	8760	100.0
2012	7121.9	928	86.9	88.6	86.9	88.5	88.7	88.0	7612	86.7
2013	6888.4	928	84.4	88.4	84.4	88.4	84.7	87.9	7392	84.4
2014	8048.6	928	97.3	88.7	97.3	88.7	99.0	88.3	8522	97.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		94			153	
C. Inspection, maintenance or repair combined with refuelling				763		
D. Inspection, maintenance or repair without refuelling	143			54		
E. Testing of plant systems or components				0		
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Z. Other					1	
Subtotal	143	94	0	817	155	2
Total		237			974	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		20
12. Reactor I&C Systems		10
15. Reactor Cooling Systems		5
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		60
32. Feedwater and Main Steam System		36
41. Main Generator Systems		11
42. Electrical Power Supply Systems	94	1
XX. Miscellaneous Systems		4
Total	94	148

# US-321 HATCH-1

**Operator:** SOUTHERN (Southern Nuclear Operating Company, Inc.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 876.0 MW(e)  
**Design Net Capacity:** 777.0 MW(e)  
**Design Discharge Burnup:** 17000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 6816.8 GW(e)·h  
**Energy Availability Factor:** 90.2%  
**Load Factor:** 88.8%  
**Operating Factor:** 90.2%  
**Energy Unavailability Factor:** 9.8%  
**Total Off-line Time:** 859 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	609.5	28.1	518.8	640.4	652.8	595.1	655.0	655.1	628.5	660.6	645.6	527.2	6816.8
<b>EAF (%)</b>	100.0	7.1	82.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.5	90.2
<b>UCF (%)</b>	100.0	7.1	82.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.5	90.2
<b>LF (%)</b>	93.5	4.8	79.7	101.5	100.2	94.4	100.5	100.5	99.7	101.4	102.2	80.9	88.8
<b>OF (%)</b>	100.0	7.1	82.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.5	90.2
<b>EUf (%)</b>	0.0	92.9	17.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5	9.8
<b>PUf (%)</b>	0.0	92.9	17.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5	9.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 30 Sep 1968  
**Date of First Criticality:** 12 Sep 1974  
**Date of Grid Connection:** 11 Nov 1974  
**Date of Commercial Operation:** 31 Dec 1975

**Lifetime Generation:** 221137.9 GW(e)·h  
**Cumulative Energy Availability Factor:** 82.1%  
**Cumulative Load Factor:** 79.6%  
**Cumulative Unit Capability Factor:** 82.1%  
**Cumulative Energy Unavailability Factor:** 17.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	38.3	786	100.0	100.0	100.0	100.0	6.5	6.5	134	18.0
1976	4133.8	786	60.0	63.1	60.0	63.1	59.9	55.7	7299	83.1
1977	3716.7	700	60.2	61.8	60.2	61.8	60.6	57.9	5802	66.2
1978	4277.2	717	68.1	63.8	68.1	63.8	68.1	61.1	6370	72.7
1979	3349.5	739	51.7	60.8	51.7	60.8	51.7	58.8	4781	54.6
1980	4790.2	764	82.3	65.2	82.1	65.1	71.4	61.4	7174	81.7
1981	2770.7	757	50.6	62.7	50.6	62.7	41.8	58.1	4384	50.0
1982	2893.9	758	49.4	60.8	49.4	60.8	43.6	56.0	4313	49.2
1983	3968.9	764	71.5	62.2	71.5	62.2	59.3	56.4	6240	71.2
1984	3609.2	752	62.5	62.2	62.3	62.2	54.6	56.2	5473	62.3
1985	4761.4	752	76.5	63.6	76.5	63.6	72.3	57.8	6694	76.4
1986	3645.4	768	59.0	63.2	59.0	63.2	54.2	57.5	5162	58.9
1987	5080.7	750	80.4	64.6	80.4	64.6	77.3	59.1	7043	80.4
1988	4115.8	756	66.0	64.7	66.0	64.7	62.0	59.4	5802	66.1
1989	6479.7	757	100.0	67.3	100.0	67.2	97.7	62.1	8760	100.0
1990	4103.4	753	65.1	67.1	65.1	67.1	62.2	62.1	5722	65.3
1991	4707.5	741	74.6	67.6	74.0	67.5	72.5	62.7	6530	74.5
1992	6157.2	741	96.1	69.2	96.1	69.2	94.6	64.6	8444	96.1
1993	4956.7	737	78.4	69.7	78.4	69.7	76.8	65.2	6913	78.9
1994	5512.2	741	85.8	70.6	85.8	70.5	84.9	66.3	7542	86.1
1995	6465.8	741	100.0	72.0	100.0	71.9	99.6	67.9	8760	100.0
1996	5726.7	788	87.8	72.8	87.8	72.7	82.6	68.6	7666	87.3
1997	6009.0	800	87.9	73.5	87.9	73.5	85.7	69.5	7637	87.2
1998	6951.8	800	99.9	74.7	99.9	74.7	99.2	70.8	8751	99.9

1999	5968.8	808	82.2	75.1	82.2	75.0	84.3	71.4	7153	81.7
2000	6413.4	860	86.2	75.6	86.2	75.5	84.8	72.0	7530	85.7
2001	7496.2	863	99.1	76.6	99.1	76.5	99.2	73.2	8689	99.2
2002	6627.1	856	88.8	77.1	88.8	77.0	88.4	73.8	7778	88.8
2003	7146.9	856	96.3	77.8	96.3	77.8	95.3	74.7	8438	96.3
2004	6896.1	869	91.7	78.4	91.7	78.3	90.8	75.3	8046	91.6
2005	6993.5	856	92.7	78.9	92.7	78.9	93.3	75.9	8121	92.7
2006	6422.8	849	85.4	79.1	85.4	79.1	86.3	76.3	7516	85.8
2007	7499.1	876	97.6	79.8	97.6	79.7	97.7	77.1	8550	97.6
2008	6433.7	876	85.7	80.0	85.7	79.9	83.6	77.3	7527	85.7
2009	7190.0	876	94.6	80.4	94.6	80.4	93.7	77.8	8289	94.6
2010	6509.9	876	87.8	80.7	87.8	80.7	84.8	78.0	7690	87.8
2011	7529.6	876	100.0	81.3	100.0	81.2	98.1	78.6	8760	100.0
2012	6802.0	876	89.7	81.5	89.7	81.5	88.4	78.9	7876	89.7
2013	7056.5	876	94.2	81.9	94.2	81.9	91.9	79.3	8251	94.2
2014	6816.8	876	90.2	82.1	90.2	82.1	88.8	79.6	7901	90.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1976 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					326	
C. Inspection, maintenance or repair combined with refuelling	750			1017		
D. Inspection, maintenance or repair without refuelling	107			92		
E. Testing of plant systems or components				0	2	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					17	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
P. Fire					10	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					1	
Z. Other				2	40	
Subtotal	857	0	0	1111	396	1
Total	857			1508		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1976 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		41
14. Safety Systems		29
15. Reactor Cooling Systems		41
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		68
32. Feedwater and Main Steam System		58
33. Circulating Water System		0
35. All other I&C Systems		7
41. Main Generator Systems		25
42. Electrical Power Supply Systems		16
XX. Miscellaneous Systems		16
Total	0	321

## US-366 HATCH-2

**Operator:** SOUTHERN (Southern Nuclear Operating Company, Inc.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 883.0 MW(e)  
**Design Net Capacity:** 784.0 MW(e)  
**Design Discharge Burnup:** 18750 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 7693.2 GW(e)·h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 99.5%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	663.9	598.5	657.3	640.6	656.9	623.7	651.7	648.7	624.5	659.8	644.0	623.6	7693.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>LF (%)</b>	101.1	100.9	100.2	100.8	100.0	98.1	99.2	98.7	98.2	100.4	101.1	94.9	99.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>EUUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1972      **Lifetime Generation:** 205996.5 GW(e)·h  
**Date of First Criticality:** 04 Jul 1978      **Cumulative Energy Availability Factor:** 83.8%  
**Date of Grid Connection:** 22 Sep 1978      **Cumulative Load Factor:** 80.5%  
**Date of Commercial Operation:** 05 Sep 1979      **Cumulative Unit Capability Factor:** 83.9%  
**Cumulative Energy Unavailability Factor:** 16.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1979	1757.0	749	100.0	100.0	100.0	100.0	80.1	80.1	2480	84.7
1980	3653.1	767	61.0	70.6	59.1	69.2	54.2	60.6	5269	60.0
1981	4481.5	772	78.7	74.1	78.7	73.3	66.3	63.0	6872	78.4
1982	3734.2	771	63.9	71.0	63.9	70.5	55.3	60.7	5588	63.8
1983	3817.2	771	66.1	69.9	66.1	69.5	56.5	59.7	5774	65.9
1984	1893.5	748	26.7	62.0	26.7	61.6	28.8	54.1	2833	32.3
1985	5376.1	748	82.6	65.2	82.6	64.9	82.0	58.4	7239	82.6
1986	3618.7	777	70.4	65.9	70.4	65.6	53.2	57.7	6169	70.4
1987	5755.6	761	95.7	69.4	95.7	69.2	86.3	61.1	8388	95.8
1988	4254.5	768	65.7	69.0	65.7	68.8	63.1	61.3	5917	67.4
1989	4147.2	768	68.6	69.0	68.6	68.8	61.6	61.3	6155	70.3
1990	6527.8	766	98.7	71.6	98.7	71.5	97.3	64.5	8649	98.7
1991	4932.2	761	74.4	71.8	74.4	71.7	74.0	65.3	6656	76.0
1992	4692.4	764	74.5	72.0	74.5	71.9	69.9	65.6	6668	75.9
1993	4999.7	757	87.4	73.1	87.4	73.0	75.4	66.3	7734	88.3
1994	5275.6	765	85.2	73.9	85.2	73.8	78.7	67.1	7534	86.0
1995	5055.5	768	77.4	74.1	77.4	74.0	75.1	67.6	6888	78.6
1996	7021.7	809	98.4	75.6	98.4	75.5	98.8	69.5	8639	98.3
1997	6033.6	818	86.4	76.2	86.4	76.1	84.2	70.4	7560	86.3
1998	5829.9	821	82.8	76.6	82.8	76.5	81.0	70.9	7247	82.7
1999	7073.6	855	93.3	77.5	93.3	77.4	94.4	72.2	8173	93.3
2000	6900.3	873	89.6	78.1	89.6	78.0	89.9	73.1	7884	89.8
2001	6584.5	878	86.3	78.5	86.3	78.5	85.6	73.8	7618	87.0
2002	7423.3	870	97.3	79.4	97.3	79.3	97.4	74.9	8544	97.5



2003	6962.5	883	91.9	80.0	91.9	79.9	91.1	75.6	8052	91.9
2004	7520.6	883	97.8	80.8	97.8	80.7	97.0	76.6	8589	97.8
2005	6727.8	883	88.2	81.1	88.2	81.0	87.0	77.0	7724	88.2
2006	7641.8	883	99.3	81.8	99.3	81.7	98.8	77.9	8694	99.2
2007	6749.0	883	88.4	82.1	88.4	82.0	87.3	78.2	7744	88.4
2008	7479.8	883	97.0	82.6	97.0	82.6	96.4	78.9	8516	96.9
2009	5218.5	883	69.9	82.2	69.9	82.1	67.5	78.5	6119	69.9
2010	7391.7	883	96.5	82.7	96.5	82.6	95.6	79.1	8456	96.5
2011	6052.0	883	84.6	82.7	84.6	82.7	78.2	79.1	7405	84.5
2012	7581.4	883	98.3	83.2	98.3	83.2	97.7	79.7	8634	98.3
2013	6767.3	883	88.2	83.4	88.2	83.3	87.5	79.9	7728	88.2
2014	7693.2	883	100.0	83.9	100.0	83.8	99.5	80.5	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1978 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					194	
C. Inspection, maintenance or repair combined with refuelling				991		
D. Inspection, maintenance or repair without refuelling				140		
E. Testing of plant systems or components				13	73	
L. Human factor related					35	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				0		
Z. Other					32	
Subtotal	0	0	0	1144	334	0
Total	0			1478		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1978 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		26
12. Reactor I&C Systems		14
14. Safety Systems		4
15. Reactor Cooling Systems		43
31. Turbine and auxiliaries		26
32. Feedwater and Main Steam System		36
33. Circulating Water System		1
41. Main Generator Systems		24
42. Electrical Power Supply Systems		11
XX. Miscellaneous Systems		4
Total	0	189

# US-354 HOPE CREEK-1

**Operator:** PSEG (PSEG Nuclear LLC)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1172.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 30000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 10406.1 GW(e)·h  
**Energy Availability Factor:** 98.6%  
**Load Factor:** 101.4%  
**Operating Factor:** 98.6%  
**Energy Unavailability Factor:** 1.4%  
**Total Off-line Time:** 124 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	922.5	828.2	917.1	849.9	870.9	865.8	889.0	891.3	674.5	902.7	885.3	908.8	10406.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.7	100.0	100.0	100.0	98.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.7	100.0	100.0	100.0	98.6
<b>LF (%)</b>	105.8	105.2	105.3	100.7	99.9	102.6	102.0	102.2	79.9	103.5	104.8	104.2	101.4
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.8	100.0	100.0	100.0	98.6
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.3	0.0	0.0	0.0	1.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.3	0.0	0.0	0.0	1.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Mar 1976  
**Date of First Criticality:** 28 Jun 1986  
**Date of Grid Connection:** 01 Aug 1986  
**Date of Commercial Operation:** 20 Dec 1986

**Lifetime Generation:** 226261.6 GW(e)·h  
**Cumulative Energy Availability Factor:** 87.3%  
**Cumulative Load Factor:** 86.0%  
**Cumulative Unit Capability Factor:** 87.3%  
**Cumulative Energy Unavailability Factor:** 12.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986			Data not provided							
1987	7308.7	1067	92.7	92.7	92.7	92.7	78.2	78.2	7457	85.1
1988	6470.9	1061	79.0	85.9	79.0	85.9	69.4	73.8	6369	72.5
1989	6614.3	1031	76.7	82.9	76.7	82.9	73.2	73.6	6717	76.7
1990	8100.1	1031	90.7	84.8	90.7	84.8	89.7	77.6	7940	90.6
1991	7402.7	1031	83.1	84.5	83.1	84.5	82.0	78.4	7280	83.1
1992	7059.1	1031	78.9	83.5	78.9	83.5	77.9	78.4	6930	78.9
1993	8825.3	1031	97.4	85.5	97.4	85.5	97.7	81.1	8526	97.3
1994	7125.6	1031	79.6	84.8	79.6	84.8	78.9	80.8	6969	79.6
1995	7072.3	1031	79.2	84.2	79.2	84.2	78.3	80.5	6937	79.2
1996	6770.7	1031	75.4	83.3	75.4	83.3	74.8	80.0	6618	75.3
1997	6417.8	1031	74.3	82.5	74.3	82.5	71.1	79.2	6511	74.3
1998	8700.4	1031	97.5	83.7	97.5	83.7	96.3	80.6	8539	97.5
1999	7701.1	1031	86.1	83.9	86.1	83.9	85.3	80.9	7538	86.1
2000	7271.7	1031	82.6	83.8	82.6	83.8	80.3	80.9	7259	82.6
2001	8065.3	1049	89.8	84.2	89.8	84.2	88.7	81.4	7859	89.7
2002	8843.1	1049	97.7	85.0	97.7	85.0	96.2	82.4	8555	97.7
2003	7260.6	1049	81.5	84.8	81.5	84.8	79.0	82.2	7137	81.5
2004	6048.9	1049	69.7	84.0	69.7	84.0	65.6	81.2	6123	69.7
2005	7684.8	1049	84.2	84.0	84.2	84.0	83.6	81.4	7379	84.2
2006	8617.8	1059	91.8	84.4	91.8	84.4	92.9	81.9	8042	91.8
2007	8104.5	1061	88.8	84.6	88.8	84.6	87.2	82.2	7774	88.7
2008	10006.3	1186	99.7	85.4	99.7	85.4	100.4	83.1	8756	99.7
2009	9700.3	1161	92.4	85.7	92.4	85.7	95.4	83.7	8104	92.5

2010	9438.5	1191	91.4	86.0	91.4	86.0	92.6	84.1	8001	91.3
2011	10505.9	1191	99.2	86.5	99.2	86.5	100.7	84.8	8690	99.2
2012	9586.2	1172	92.7	86.8	92.7	86.8	93.1	85.2	8141	92.7
2013	9112.7	1172	88.5	86.9	88.5	86.9	88.7	85.3	7751	88.5
2014	10406.1	1172	98.6	87.3	98.6	87.3	101.4	86.0	8636	98.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					205	
C. Inspection, maintenance or repair combined with refuelling				777		
D. Inspection, maintenance or repair without refuelling	124			102		
E. Testing of plant systems or components				0		
L. Human factor related					15	
P. Fire					1	
Z. Other					3	
Subtotal	124	0	0	879	224	0
Total	124			1103		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		26
15. Reactor Cooling Systems		32
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		33
32. Feedwater and Main Steam System		29
33. Circulating Water System		7
35. All other I&C Systems		1
41. Main Generator Systems		18
42. Electrical Power Supply Systems		29
XX. Miscellaneous Systems		1
Total	0	202

## US-247 INDIAN POINT-2

Operator: ENTERGY (Entergy Nuclear Operations, Inc.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1020.0 MW(e)  
 Design Net Capacity: 873.0 MW(e)  
 Design Discharge Burnup: 36000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8313.1 GW(e)·h  
 Energy Availability Factor: 93.5%  
 Load Factor: 93.0%  
 Operating Factor: 93.5%  
 Energy Unavailability Factor: 6.5%  
 Total Off-line Time: 566 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	768.2	564.4	261.6	742.0	761.8	731.6	746.7	746.9	724.8	758.3	739.5	767.2	8313.1
EAF (%)	100.0	82.3	39.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.5
UCF (%)	100.0	82.3	39.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.5
LF (%)	101.2	82.3	34.5	101.0	100.4	99.6	98.4	98.4	98.7	99.9	100.6	101.1	93.0
OF (%)	100.0	82.3	39.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.5
EUf (%)	0.0	17.7	60.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5
PUf (%)	0.0	17.7	60.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 14 Oct 1966      Lifetime Generation: 244113.1 GW(e)·h  
 Date of First Criticality: 22 May 1973      Cumulative Energy Availability Factor: 75.4%  
 Date of Grid Connection: 26 Jun 1973      Cumulative Load Factor: 73.8%  
 Date of Commercial Operation: 01 Aug 1974      Cumulative Unit Capability Factor: 75.5%  
    Cumulative Energy Unavailability Factor: 24.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	2037.0	873	79.8	79.8	79.8	79.8	63.5	63.5	2933	79.9
1975	4646.0	865	61.3	66.8	61.3	66.8	61.3	62.0	6545	74.7
1976	2287.1	864	30.2	51.7	30.2	51.7	30.1	48.8	3054	34.8
1977	5210.3	864	68.9	56.7	68.9	56.7	68.8	54.7	6626	75.6
1978	4372.9	859	58.2	57.0	58.2	57.0	58.1	55.4	5503	62.8
1979	4808.4	856	64.1	58.3	64.1	58.3	64.1	57.0	6156	70.3
1980	4273.2	856	66.8	59.6	63.9	59.2	56.8	57.0	5689	64.8
1981	3065.0	856	44.9	57.7	44.9	57.3	40.9	54.8	4027	46.0
1982	4458.6	862	65.0	58.5	65.0	58.2	59.0	55.3	5726	65.4
1983	5895.3	859	83.5	61.2	83.5	60.9	78.3	57.8	7354	83.9
1984	2891.6	864	48.4	59.9	48.4	59.7	38.1	55.9	4552	51.8
1985	6665.0	855	95.5	63.0	95.5	62.8	89.0	58.8	8382	95.7
1986	3827.4	855	52.6	62.2	52.6	62.0	51.1	58.1	4924	56.2
1987	5149.6	852	69.8	62.8	69.8	62.5	68.9	58.9	6331	72.3
1988	6064.0	856	81.0	64.0	81.0	63.8	80.6	60.4	7247	82.5
1989	4476.9	856	60.4	63.8	60.4	63.6	59.7	60.4	5556	63.4
1990	5222.1	886	64.3	63.8	64.3	63.6	67.2	60.8	5779	66.0
1991	3873.4	929	51.2	63.0	51.2	62.9	47.6	60.0	4495	51.3
1992	7880.6	939	96.7	65.0	96.7	64.9	95.5	62.1	8494	96.7
1993	5931.7	941	75.3	65.6	75.3	65.4	72.0	62.6	6570	75.0
1994	7634.6	941	100.0	67.4	100.0	67.3	92.6	64.2	8760	100.0
1995	4896.9	941	63.6	67.2	63.6	67.1	59.4	64.0	5533	63.2
1996	7831.8	941	94.2	68.5	94.2	68.4	94.7	65.4	8261	94.0
1997	3179.7	936	41.7	67.3	41.7	67.2	38.8	64.2	3639	41.5

1998	2512.5	932	30.9	65.7	30.9	65.6	30.8	62.8	2698	30.8
1999	7300.4	937	87.6	66.6	87.6	66.5	88.9	63.9	7665	87.5
2000	1062.3	941	12.5	64.5	12.5	64.4	12.9	61.8	1099	12.5
2001	7792.7	951	96.2	65.7	96.2	65.6	94.5	63.1	8429	96.2
2002	7556.6	951	90.2	66.6	90.2	66.5	91.7	64.1	7931	90.5
2003	8370.8	956	98.1	67.7	98.1	67.6	100.3	65.5	8597	98.1
2004	7513.1	956	89.3	68.5	89.3	68.4	89.5	66.3	7851	89.4
2005	8847.1	965	99.7	69.6	99.7	69.5	104.6	67.6	8730	99.6
2006	7984.7	1020	90.6	70.3	90.6	70.2	89.4	68.4	7937	90.6
2007	8842.6	1020	99.1	71.3	99.1	71.2	99.0	69.4	8679	99.1
2008	8205.2	1020	92.1	71.9	92.1	71.9	91.6	70.1	8088	92.1
2009	8837.4	1025	99.0	72.8	99.0	72.7	98.4	71.0	8667	98.9
2010	7325.9	1022	82.9	73.1	82.9	73.0	81.8	71.3	7267	83.0
2011	8767.2	1022	98.7	73.9	98.7	73.8	97.9	72.1	8648	98.7
2012	7911.3	1020	89.6	74.3	89.6	74.2	88.3	72.6	7867	89.6
2013	8763.1	1020	99.0	75.0	99.0	74.9	98.1	73.3	8675	99.0
2014	8313.1	1020	93.5	75.5	93.5	75.4	93.0	73.8	8194	93.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1973 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					857	
C. Inspection, maintenance or repair combined with refuelling	565			953		
D. Inspection, maintenance or repair without refuelling				245		
E. Testing of plant systems or components				21		
H. Nuclear regulatory requirements					3	
J. Grid limitation, failure or grid unavailability						6
L. Human factor related					6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other				4	10	
Subtotal	565	0	0	1223	876	7
Total		565			2106	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1973 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		44
13. Reactor Auxiliary Systems		7
14. Safety Systems		8
15. Reactor Cooling Systems		60
16. Steam generation systems		70
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		67
31. Turbine and auxiliaries		52
32. Feedwater and Main Steam System		291
35. All other I&C Systems		2
41. Main Generator Systems		42
42. Electrical Power Supply Systems		205
XX. Miscellaneous Systems		0
Total	0	851

## US-286 INDIAN POINT-3

Operator: ENTERGY (Entergy Nuclear Operations, Inc.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1040.0 MW(e)  
 Design Net Capacity: 965.0 MW(e)  
 Design Discharge Burnup: 14000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8971.5 GW(e)·h  
 Energy Availability Factor: 99.0%  
 Load Factor: 98.5%  
 Operating Factor: 99.0%  
 Energy Unavailability Factor: 1.0%  
 Total Off-line Time: 91 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	712.8	702.1	776.8	753.0	774.5	739.5	764.4	694.0	746.6	776.1	753.6	778.2	8971.5
EAF (%)	94.7	100.0	100.0	100.0	100.0	100.0	100.0	93.0	100.0	100.0	100.0	100.0	99.0
UCF (%)	94.7	100.0	100.0	100.0	100.0	100.0	100.0	93.0	100.0	100.0	100.0	100.0	99.0
LF (%)	92.1	100.5	100.5	100.6	100.1	98.8	98.8	89.7	99.7	100.3	100.5	100.6	98.5
OF (%)	94.8	100.0	100.0	100.0	100.0	100.0	100.0	93.0	100.0	100.0	100.0	100.0	99.0
EUf (%)	5.3	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	1.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	5.3	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	1.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Nov 1968      Lifetime Generation: 230433.3 GW(e)·h  
 Date of First Criticality: 06 Apr 1976      Cumulative Energy Availability Factor: 72.5%  
 Date of Grid Connection: 27 Apr 1976      Cumulative Load Factor: 70.0%  
 Date of Commercial Operation: 30 Aug 1976      Cumulative Unit Capability Factor: 72.6%  
    Cumulative Energy Unavailability Factor: 27.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1976	2257.5	899	100.0	100.0	100.0	100.0	70.4	70.4	2871	78.2
1977	5520.8	873	72.1	80.3	72.1	80.3	72.2	71.7	6556	74.8
1978	5457.6	911	68.3	75.3	68.3	75.3	68.4	70.3	6365	72.7
1979	4794.6	965	56.7	69.5	56.7	69.5	56.7	66.1	5824	66.5
1980	3070.4	965	53.6	65.7	53.6	65.7	36.2	59.0	4667	53.1
1981	3033.4	965	59.4	64.5	59.4	64.5	35.9	54.6	5236	59.8
1982	1436.1	891	22.5	58.2	22.5	58.2	18.4	49.2	1967	22.5
1983	60.7	934	2.4	50.6	2.4	50.6	0.7	42.6	229	2.6
1984	6041.7	965	76.2	53.8	76.2	53.8	71.3	46.1	6703	76.3
1985	4728.5	965	65.5	55.1	65.5	55.1	55.9	47.2	5782	66.0
1986	5525.6	959	72.9	56.8	72.9	56.8	65.8	49.0	6431	73.4
1987	4850.6	950	60.5	57.2	60.5	57.2	58.3	49.8	5396	61.6
1988	6711.9	965	81.9	59.2	81.9	59.2	79.2	52.3	7217	82.2
1989	4968.7	965	59.7	59.2	59.7	59.2	58.8	52.8	5279	60.3
1990	5031.8	965	60.8	59.4	60.8	59.4	59.5	53.2	5374	61.3
1991	7300.8	965	88.8	61.3	88.8	61.3	86.4	55.4	7577	86.5
1992	4760.6	965	59.2	61.2	59.2	61.2	56.2	55.5	5248	59.7
1993	1192.6	965	13.4	58.4	13.4	58.4	14.1	53.1	1292	14.7
1994	0.0	965	0.0	55.2	0.0	55.2	0.0	50.1	0	0.0
1995	1471.5	965	18.2	53.2	18.2	53.2	17.4	48.4	1696	19.4
1996	5872.5	965	72.4	54.2	72.4	54.2	69.3	49.5	6390	72.7
1997	4337.3	965	57.4	54.3	57.4	54.3	51.3	49.5	4650	53.1
1998	7656.5	965	93.6	56.1	93.6	56.1	90.6	51.4	8197	93.6
1999	7269.2	965	87.4	57.5	87.4	57.5	86.0	52.9	7659	87.4

2000	8432.2	965	97.9	59.1	97.9	59.1	99.5	54.8	8600	97.9
2001	7940.2	965	92.8	60.5	92.8	60.5	93.9	56.4	8130	92.8
2002	8432.6	979	98.3	61.9	98.3	61.9	99.6	58.1	8611	98.3
2003	7608.4	979	88.4	62.9	88.4	62.9	88.7	59.2	7748	88.4
2004	8747.3	979	100.0	64.3	100.0	64.3	101.7	60.7	8784	100.0
2005	8037.2	985	91.0	65.2	91.0	65.2	93.1	61.9	7969	91.0
2006	8974.5	1025	99.4	66.4	99.4	66.4	100.0	63.2	8705	99.4
2007	7797.3	1025	86.8	67.1	86.8	67.1	86.8	64.0	7602	86.8
2008	9162.7	1025	100.0	68.2	100.0	68.2	101.8	65.3	8784	100.0
2009	7703.7	1040	87.5	68.8	87.5	68.8	84.6	65.9	7649	87.3
2010	8994.7	1040	99.0	69.7	99.0	69.7	98.7	66.9	8676	99.0
2011	8217.0	1040	90.8	70.4	90.8	70.4	90.2	67.6	7953	90.8
2012	8963.1	1040	99.3	71.2	98.5	71.2	98.1	68.5	8649	98.5
2013	8288.9	1041	91.6	71.8	91.6	71.8	90.9	69.1	8025	91.6
2014	8971.5	1040	99.0	72.6	99.0	72.5	98.5	70.0	8669	99.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1976 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		91			1116	
C. Inspection, maintenance or repair combined with refuelling				997		
D. Inspection, maintenance or repair without refuelling				224		
E. Testing of plant systems or components				1	10	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
P. Fire					0	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					0	
Z. Other					10	
Subtotal	0	91	0	1222	1140	6
Total		91			2368	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1976 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	51	16
13. Reactor Auxiliary Systems		8
14. Safety Systems		525
15. Reactor Cooling Systems		31
16. Steam generation systems	39	65
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		92
32. Feedwater and Main Steam System		48
33. Circulating Water System		0
41. Main Generator Systems		272
42. Electrical Power Supply Systems		44
XX. Miscellaneous Systems		8
Total	90	1109

**US-373 LASALLE-1****Operator:** EXELON (Exelon Generation Co., LLC)**Contractor:** GE (GENERAL ELECTRIC CO.)**1. Station Details**

**Type:** BWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1137.0 MW(e)

**Design Net Capacity:** 1078.0 MW(e)

**Design Discharge Burnup:** 45000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 9267.7 GW(e)·h

**Energy Availability Factor:** 92.4%

**Load Factor:** 93.0%

**Operating Factor:** 92.4%

**Energy Unavailability Factor:** 7.6%

**Total Off-line Time:** 668 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	863.7	217.3	816.6	844.1	863.1	826.0	851.2	851.4	824.9	591.5	846.8	871.1	9267.7
<b>EAF (%)</b>	100.0	32.1	97.2	100.0	100.0	100.0	100.0	100.0	100.0	74.3	100.0	100.0	92.4
<b>UCF (%)</b>	100.0	32.1	97.2	100.0	100.0	100.0	100.0	100.0	100.0	74.3	100.0	100.0	92.4
<b>LF (%)</b>	102.1	28.4	96.7	103.1	102.0	100.9	100.6	100.7	100.8	69.9	103.3	103.0	93.0
<b>OF (%)</b>	100.0	32.1	97.2	100.0	100.0	100.0	100.0	100.0	100.0	74.3	100.0	100.0	92.4
<b>EUf (%)</b>	0.0	67.9	2.8	0.0	0.0	0.0	0.0	0.0	0.0	25.7	0.0	0.0	7.6
<b>PUf (%)</b>	0.0	67.9	2.8	0.0	0.0	0.0	0.0	0.0	0.0	25.7	0.0	0.0	7.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 10 Sep 1973      **Lifetime Generation:** 229008.0 GW(e)·h

**Date of First Criticality:** 21 Jun 1982      **Cumulative Energy Availability Factor:** 79.3%

**Date of Grid Connection:** 04 Sep 1982      **Cumulative Load Factor:** 77.5%

**Date of Commercial Operation:** 01 Jan 1984      **Cumulative Unit Capability Factor:** 79.3%

**Cumulative Energy Unavailability Factor:** 20.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	5206.2	1078	69.4	69.4	69.4	69.4	55.0	55.0	6052	68.9
1985	4827.5	1036	64.3	66.9	63.7	66.6	53.2	54.1	5581	63.7
1986	2100.8	1036	25.8	53.4	25.8	53.2	23.1	43.9	2331	26.6
1987	4108.1	1036	61.9	55.5	61.9	55.3	45.3	44.3	5455	62.3
1988	5453.7	1036	65.9	57.6	65.9	57.4	59.9	47.4	5818	66.2
1989	6180.6	1036	69.7	59.6	69.7	59.5	68.1	50.8	6103	69.7
1990	8637.4	1036	95.0	64.6	95.0	64.5	95.2	57.1	8329	95.1
1991	6841.4	1036	75.4	65.9	75.4	65.9	75.4	59.4	6627	75.7
1992	6469.3	1036	74.0	66.8	74.0	66.8	71.1	60.7	6528	74.3
1993	7207.5	1036	81.0	68.2	81.0	68.2	79.4	62.5	7102	81.1
1994	4945.3	1036	57.8	67.3	57.8	67.2	54.5	61.8	5095	58.2
1995	8239.6	1036	93.9	69.5	93.9	69.5	90.8	64.2	8226	93.9
1996	3300.4	1036	37.5	67.0	37.5	67.0	36.3	62.1	3349	38.1
1997	0.0	1036	0.0	62.3	0.0	62.2	0.0	57.7	0	0.0
1998	3336.7	1036	36.3	60.5	36.3	60.5	36.8	56.3	3174	36.2
1999	8013.7	1036	90.8	62.4	90.8	62.4	88.3	58.3	7963	90.9
2000	9745.4	1078	100.0	64.7	100.0	64.7	102.8	61.0	8784	100.0
2001	9850.4	1111	99.4	66.8	99.4	66.7	101.0	63.3	8708	99.4
2002	8927.6	1111	90.6	68.1	90.6	68.1	91.7	64.9	7945	90.7
2003	9739.0	1111	99.5	69.8	99.5	69.7	100.1	66.8	8716	99.5
2004	9051.5	1111	91.5	70.9	91.5	70.8	92.8	68.1	8059	91.7
2005	9812.0	1146	100.0	72.3	100.0	72.3	97.7	69.5	8760	100.0
2006	9092.1	1118	92.8	73.2	92.8	73.2	92.8	70.6	8129	92.8
2007	9664.6	1118	100.0	74.4	100.0	74.4	98.7	71.8	8760	100.0



2008	8883.8	1118	92.3	75.1	92.3	75.1	90.5	72.6	8103	92.2
2009	9700.7	1118	98.0	76.1	98.0	76.0	99.1	73.7	8580	97.9
2010	9207.0	1118	92.7	76.7	92.7	76.7	94.0	74.5	8119	92.7
2011	9851.7	1118	97.4	77.5	97.4	77.5	100.6	75.4	8529	97.4
2012	9471.2	1137	93.6	78.1	93.6	78.0	95.1	76.2	8213	93.5
2013	9774.5	1137	100.0	78.8	100.0	78.8	98.1	76.9	8465	96.6
2014	9267.7	1137	92.4	79.3	92.4	79.3	93.0	77.5	8092	92.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					390	
C. Inspection, maintenance or repair combined with refuelling	477			912		
D. Inspection, maintenance or repair without refuelling	191			353		
E. Testing of plant systems or components				48	3	
H. Nuclear regulatory requirements					167	
J. Grid limitation, failure or grid unavailability						10
L. Human factor related					30	
Z. Other					4	
Subtotal	668	0	0	1313	594	10
Total	668			1917		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		31
12. Reactor I&C Systems		22
13. Reactor Auxiliary Systems		13
14. Safety Systems		37
15. Reactor Cooling Systems		106
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		90
32. Feedwater and Main Steam System		15
33. Circulating Water System		7
35. All other I&C Systems		3
41. Main Generator Systems		11
42. Electrical Power Supply Systems		38
XX. Miscellaneous Systems		10
Total	0	384

# US-374 LASALLE-2

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1140.0 MW(e)

Design Net Capacity: 1078.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9487.3 GW(e)·h

Energy Availability Factor: 93.9%

Load Factor: 95.0%

Operating Factor: 93.9%

Energy Unavailability Factor: 6.1%

Total Off-line Time: 532 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	873.6	789.3	868.3	723.2	664.1	826.1	850.8	483.4	826.3	867.3	845.7	869.3	9487.3
EAF (%)	100.0	100.0	100.0	86.7	81.8	100.0	100.0	59.6	100.0	100.0	100.0	100.0	93.9
UCF (%)	100.0	100.0	100.0	86.7	81.8	100.0	100.0	59.6	100.0	100.0	100.0	100.0	93.9
LF (%)	103.0	103.0	102.5	88.1	78.3	100.6	100.3	57.0	100.7	102.3	102.9	102.5	95.0
OF (%)	100.0	100.0	100.0	86.7	81.7	100.0	100.0	59.7	100.0	100.0	100.0	100.0	93.9
EUf (%)	0.0	0.0	0.0	13.3	18.2	0.0	0.0	40.4	0.0	0.0	0.0	0.0	6.1
PUf (%)	0.0	0.0	0.0	13.3	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.4	0.0	0.0	0.0	0.0	3.4
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 10 Sep 1973      Lifetime Generation: 223480.0 GW(e)·h

Date of First Criticality: 10 Mar 1984      Cumulative Energy Availability Factor: 78.7%

Date of Grid Connection: 20 Apr 1984      Cumulative Load Factor: 77.8%

Date of Commercial Operation: 19 Oct 1984      Cumulative Unit Capability Factor: 78.7%

   Cumulative Energy Unavailability Factor: 21.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	1392.1	1039	86.4	86.4	86.4	86.4	75.7	75.7	1536	86.5
1985	3477.0	1036	41.8	49.3	41.8	49.3	38.3	44.6	3698	42.2
1986	5727.8	1036	75.0	61.0	74.6	60.8	63.1	53.0	6533	74.6
1987	4573.3	1036	53.1	58.5	53.1	58.4	50.4	52.2	4699	53.6
1988	5662.8	1036	75.1	62.5	75.1	62.4	62.2	54.6	6593	75.1
1989	6506.8	1036	75.1	64.9	75.1	64.8	71.7	57.9	6591	75.2
1990	6216.8	1036	70.0	65.7	70.0	65.7	68.5	59.6	6162	70.3
1991	8712.4	1036	95.3	69.8	95.3	69.8	96.0	64.6	8357	95.4
1992	5797.9	1036	66.3	69.4	66.3	69.4	63.7	64.5	5850	66.6
1993	5859.2	1036	66.1	69.0	66.1	69.0	64.6	64.5	5825	66.5
1994	8428.9	1036	92.4	71.3	92.4	71.3	92.9	67.3	8101	92.5
1995	5905.7	1036	66.5	70.9	66.5	70.9	65.1	67.1	5855	66.8
1996	5642.3	1036	64.5	70.4	64.5	70.3	62.0	66.7	5649	64.3
1997	0.0	1036	0.0	65.1	0.0	65.0	0.0	61.6	0	0.0
1998	0.0	1036	0.0	60.5	0.0	60.4	0.0	57.3	0	0.0
1999	6632.3	1036	71.1	61.2	71.1	61.1	73.1	58.3	6231	71.1
2000	9040.4	1072	93.1	63.2	93.1	63.2	96.0	60.7	8229	93.7
2001	9683.4	1111	97.2	65.3	97.2	65.3	99.3	63.1	8515	97.2
2002	8995.6	1111	92.1	66.9	92.1	66.9	92.4	64.8	8078	92.2
2003	8709.1	1111	88.4	68.1	88.4	68.0	89.5	66.2	7762	88.6
2004	9940.4	1111	99.8	69.7	99.8	69.7	101.9	68.1	8764	99.8
2005	8901.2	1147	89.7	70.7	89.7	70.7	88.6	69.1	7857	89.7
2006	10015.7	1120	100.0	72.1	100.0	72.1	102.1	70.7	8760	100.0
2007	9315.5	1120	94.6	73.2	94.6	73.1	94.9	71.8	8287	94.6

2008	9964.6	1120	100.0	74.3	100.0	74.3	101.3	73.1	8784	100.0
2009	9108.0	1120	92.0	75.1	92.0	75.0	92.8	73.9	8058	92.0
2010	9925.5	1120	100.0	76.1	100.0	76.0	101.2	75.0	8760	100.0
2011	9404.8	1140	94.1	76.8	94.1	76.7	94.4	75.7	8238	94.0
2012	10123.7	1140	100.0	77.6	100.0	77.6	101.1	76.7	8784	100.0
2013	8985.8	1140	92.9	78.2	92.9	78.2	90.0	77.2	7962	90.9
2014	9487.3	1140	93.9	78.7	93.9	78.7	95.0	77.8	8228	93.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		300			227	
C. Inspection, maintenance or repair combined with refuelling				1037		
D. Inspection, maintenance or repair without refuelling	231			150		
E. Testing of plant systems or components				1		
H. Nuclear regulatory requirements					364	
J. Grid limitation, failure or grid unavailability						6
L. Human factor related					6	
Z. Other					56	
Subtotal	231	300	0	1188	653	6
Total		531			1847	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		56
12. Reactor I&C Systems		53
15. Reactor Cooling Systems	300	14
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		42
32. Feedwater and Main Steam System		11
35. All other I&C Systems		10
42. Electrical Power Supply Systems		20
XX. Miscellaneous Systems		17
Total	300	223

# US-352 LIMERICK-1

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1130.0 MW(e)  
 Design Net Capacity: 1055.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9112.3 GW(e)·h  
 Energy Availability Factor: 90.5%  
 Load Factor: 92.1%  
 Operating Factor: 90.5%  
 Energy Unavailability Factor: 9.5%  
 Total Off-line Time: 834 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	879.8	788.6	108.1	537.4	860.1	824.4	848.1	851.0	818.9	866.0	850.8	879.0	9112.3
EAF (%)	100.0	100.0	12.9	74.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.5
UCF (%)	100.0	100.0	12.9	74.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.5
LF (%)	104.6	103.9	12.9	66.1	102.3	101.3	100.9	101.2	100.7	103.0	104.4	104.6	92.1
OF (%)	100.0	100.0	12.9	74.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.5
EUf (%)	0.0	0.0	87.1	26.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5
PUf (%)	0.0	0.0	48.5	26.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
UCLF (%)	0.0	0.0	38.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 19 Jun 1974      Lifetime Generation: 248035.4 GW(e)·h  
 Date of First Criticality: 22 Dec 1984      Cumulative Energy Availability Factor: 90.6%  
 Date of Grid Connection: 13 Apr 1985      Cumulative Load Factor: 88.1%  
 Date of Commercial Operation: 01 Feb 1986      Cumulative Unit Capability Factor: 90.6%  
    Cumulative Energy Unavailability Factor: 9.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	6848.9	1055	82.8	82.8	82.8	82.8	81.0	81.0	6634	82.8
1987	5341.3	1055	67.7	74.9	67.7	74.9	57.8	68.9	5924	67.6
1988	6674.8	1055	96.4	82.3	96.4	82.3	72.0	70.0	8470	96.4
1989	5244.3	1055	69.4	79.0	69.4	79.0	56.7	66.6	5638	64.4
1990	5633.1	1055	65.3	76.2	65.3	76.2	61.0	65.4	5724	65.3
1991	8133.8	1055	91.8	78.9	91.8	78.9	88.0	69.3	8043	91.8
1992	6239.6	1055	69.6	77.5	69.6	77.5	67.3	69.0	6115	69.6
1993	8745.5	1055	98.5	80.2	98.5	80.2	94.6	72.2	8626	98.5
1994	7858.0	1055	89.5	81.2	89.5	81.2	85.0	73.7	7840	89.5
1995	8147.5	1055	91.1	82.2	91.1	82.2	88.2	75.1	7973	91.0
1996	8141.6	1096	88.8	82.8	88.8	82.8	84.5	76.0	7758	88.3
1997	9227.5	1105	97.5	84.1	97.5	84.1	95.3	77.7	8534	97.4
1998	7449.1	1112	81.6	83.9	81.6	83.9	76.4	77.6	7061	80.6
1999	9744.0	1134	98.0	85.0	98.0	85.0	98.1	79.1	8588	98.0
2000	8988.1	1139	90.9	85.4	90.9	85.4	89.8	79.9	7982	90.9
2001	10133.1	1143	99.7	86.4	99.7	86.4	101.2	81.3	8735	99.7
2002	9286.8	1134	94.1	86.8	94.1	86.8	93.5	82.1	8244	94.1
2003	10057.5	1134	99.0	87.5	99.0	87.5	101.2	83.2	8672	99.0
2004	9539.1	1134	95.0	88.0	95.0	88.0	95.8	83.9	8345	95.0
2005	9926.9	1134	98.7	88.5	98.7	88.5	99.9	84.7	8642	98.6
2006	9320.4	1134	93.9	88.8	93.9	88.8	93.8	85.2	8224	93.9
2007	9994.4	1134	99.8	89.3	99.8	89.3	100.6	85.9	8744	99.8
2008	9342.5	1134	93.9	89.5	93.9	89.5	93.8	86.3	8251	93.9
2009	10019.4	1130	100.0	90.0	100.0	90.0	101.2	86.9	8760	100.0

2010	9046.9	1130	92.8	90.1	92.8	90.1	91.4	87.1	8129	92.8
2011	9550.2	1130	96.3	90.3	96.3	90.3	96.5	87.5	8435	96.3
2012	8599.5	1130	87.0	90.2	87.0	90.2	86.6	87.4	7637	86.9
2013	10147.1	1130	100.0	90.6	100.0	90.6	102.5	88.0	8760	100.0
2014	9112.3	1130	90.5	90.6	90.5	90.6	92.1	88.1	7926	90.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		287			142	
C. Inspection, maintenance or repair combined with refuelling	540			612		
D. Inspection, maintenance or repair without refuelling				206		
E. Testing of plant systems or components	6			10	10	
Z. Other				87	30	
Subtotal	546	287	0	915	182	0
Total		833			1097	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		9
13. Reactor Auxiliary Systems		7
14. Safety Systems		11
15. Reactor Cooling Systems		27
31. Turbine and auxiliaries	287	41
32. Feedwater and Main Steam System		9
41. Main Generator Systems		9
42. Electrical Power Supply Systems		16
XX. Miscellaneous Systems		9
Total	287	138

## US-353 LIMERICK-2

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1134.0 MW(e)

Design Net Capacity: 1055.0 MW(e)

Design Discharge Burnup: 45000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 10003.1 GW(e)·h

Energy Availability Factor: 98.3%

Load Factor: 100.7%

Operating Factor: 98.3%

Energy Unavailability Factor: 1.7%

Total Off-line Time: 153 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	886.1	799.6	881.3	646.7	839.3	829.9	852.7	856.4	808.4	868.9	852.0	881.7	10003.1
EAF (%)	100.0	100.0	100.0	78.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.3
UCF (%)	100.0	100.0	100.0	78.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.3
LF (%)	105.0	104.9	104.6	79.2	99.5	101.6	101.1	101.5	99.0	103.0	104.2	104.5	100.7
OF (%)	100.0	100.0	100.0	78.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.3
EUf (%)	0.0	0.0	0.0	21.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
PUf (%)	0.0	0.0	0.0	21.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 19 Jun 1974      Lifetime Generation: 226086.4 GW(e)·h

Date of First Criticality: 12 Aug 1989      Cumulative Energy Availability Factor: 93.4%

Date of Grid Connection: 01 Sep 1989      Cumulative Load Factor: 92.5%

Date of Commercial Operation: 08 Jan 1990      Cumulative Unit Capability Factor: 93.5%

   Cumulative Energy Unavailability Factor: 6.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1990	7232.6	1055	81.8	81.8	81.8	81.8	79.8	79.8	7174	83.5
1991	7146.9	1055	77.8	79.8	77.8	79.8	77.3	78.5	6919	79.0
1992	8489.2	1055	97.4	85.7	97.4	85.7	91.6	82.9	8557	97.4
1993	7468.7	1055	82.3	84.9	82.3	84.9	80.8	82.4	7289	83.2
1994	8571.5	1055	98.8	87.6	98.8	87.6	92.7	84.5	8657	98.8
1995	8401.4	1110	91.2	88.3	91.2	88.3	86.4	84.8	7984	91.1
1996	9001.1	1115	95.7	89.4	95.1	89.3	91.9	85.9	8346	95.0
1997	8307.5	1115	89.3	89.4	89.3	89.3	85.1	85.8	7840	89.5
1998	9257.9	1115	95.3	90.0	95.3	90.0	94.8	86.8	8346	95.3
1999	8561.0	1135	88.4	89.9	88.4	89.8	86.1	86.7	7726	88.2
2000	9940.7	1145	98.6	90.7	98.6	90.7	98.8	87.9	8661	98.6
2001	9243.4	1143	93.9	91.0	93.9	90.9	92.3	88.3	8230	93.9
2002	10009.5	1134	99.0	91.6	99.0	91.6	100.8	89.3	8672	99.0
2003	9387.1	1134	94.2	91.8	94.2	91.8	94.5	89.6	8252	94.2
2004	9952.0	1134	99.4	92.3	99.4	92.3	99.9	90.3	8734	99.4
2005	9124.7	1134	92.3	92.3	92.3	92.3	91.9	90.4	8085	92.3
2006	10015.1	1134	99.4	92.8	99.4	92.7	100.8	91.1	8710	99.4
2007	9059.2	1134	91.4	92.7	91.4	92.7	91.2	91.1	8007	91.4
2008	9712.1	1134	97.0	92.9	97.0	92.9	97.5	91.4	8517	97.0
2009	9311.4	1134	94.1	93.0	94.1	93.0	93.7	91.5	8241	94.1
2010	9879.1	1134	99.6	93.3	99.6	93.3	99.4	91.9	8727	99.6
2011	8957.0	1134	90.4	93.2	90.4	93.1	90.2	91.8	7917	90.4
2012	9595.3	1134	95.6	93.3	95.6	93.2	96.3	92.0	8392	95.5
2013	9437.6	1134	93.0	93.3	93.0	93.2	95.0	92.2	8143	92.9

2014	10003.1	1134	98.3	93.5	98.3	93.4	100.7	92.5	8607	98.3
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## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					121	
C. Inspection, maintenance or repair combined with refuelling				358		
D. Inspection, maintenance or repair without refuelling	153			64		
E. Testing of plant systems or components				0		
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					11	
Z. Other					6	
Subtotal	153	0	0	422	138	2
Total	153			562		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		5
13. Reactor Auxiliary Systems		3
15. Reactor Cooling Systems		7
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		61
32. Feedwater and Main Steam System		6
35. All other I&C Systems		7
41. Main Generator Systems		12
42. Electrical Power Supply Systems		13
XX. Miscellaneous Systems		0
Total	0	117

# US-369 MCGUIRE-1

Operator: DUKEENER (Duke Energy Corp.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1158.0 MW(e)  
 Design Net Capacity: 1180.0 MW(e)  
 Design Discharge Burnup: 40200 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8227.6 GW(e)·h  
 Energy Availability Factor: 82.1%  
 Load Factor: 81.1%  
 Operating Factor: 82.1%  
 Energy Unavailability Factor: 17.9%  
 Total Off-line Time: 1566 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	866.2	781.5	862.6	833.1	858.4	820.7	843.2	843.6	322.4	0.0	343.7	852.1	8227.6
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	40.6	0.0	45.4	100.0	82.1
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	40.6	0.0	45.4	100.0	82.1
LF (%)	100.5	100.4	100.3	99.9	99.6	98.4	97.9	97.9	38.7	0.0	41.2	98.9	81.1
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	40.6	0.0	45.4	100.0	82.1
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.4	100.0	54.6	0.0	17.9
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.4	100.0	54.6	0.0	17.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Apr 1971      Lifetime Generation: 259211.9 GW(e)·h  
 Date of First Criticality: 08 Aug 1981      Cumulative Energy Availability Factor: 81.9%  
 Date of Grid Connection: 12 Sep 1981      Cumulative Load Factor: 79.3%  
 Date of Commercial Operation: 01 Dec 1981      Cumulative Unit Capability Factor: 82.1%  
    Cumulative Energy Unavailability Factor: 18.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	19.1	1146	10.2	10.2	10.2	10.2	2.2	2.2	45	6.0
1982	4302.3	1180	81.6	76.0	81.6	76.0	41.6	38.5	7043	80.4
1983	4650.0	1180	57.3	67.0	57.3	67.0	45.0	41.6	4852	55.4
1984	6434.3	1180	78.1	70.6	69.3	67.8	62.1	48.3	6011	68.4
1985	6780.1	1180	77.1	72.2	77.1	70.1	65.6	52.5	6747	77.0
1986	5181.1	1150	56.2	69.1	56.2	67.4	51.4	52.3	4912	56.1
1987	7352.9	1150	76.7	70.3	76.7	68.9	73.0	55.6	6713	76.6
1988	7406.4	1129	77.0	71.3	77.0	70.0	74.7	58.3	6763	77.0
1989	7807.2	1129	84.5	72.9	84.5	71.7	78.9	60.7	7187	82.0
1990	4755.3	1129	56.9	71.1	56.9	70.2	48.1	59.4	4718	53.9
1991	6851.1	1129	71.4	71.2	71.4	70.3	69.3	60.3	6259	71.4
1992	7485.3	1129	77.9	71.8	77.9	71.0	75.5	61.7	6839	77.9
1993	5537.1	1129	58.2	70.7	58.2	69.9	56.0	61.2	5095	58.2
1994	6877.3	1129	71.9	70.8	71.9	70.1	69.5	61.8	6291	71.8
1995	8860.2	1129	91.6	72.2	91.6	71.6	89.6	63.8	8017	91.5
1996	8558.3	1129	89.5	73.3	89.5	72.7	86.3	65.3	7858	89.5
1997	7011.3	1129	72.7	73.3	72.7	72.7	70.9	65.6	6361	72.6
1998	8822.6	1119	90.0	74.3	90.0	73.7	90.0	67.0	7889	90.1
1999	8593.3	1100	86.6	74.9	86.6	74.4	89.2	68.2	7584	86.6
2000	9995.0	1100	99.5	76.2	99.5	75.7	103.4	70.0	8741	99.5
2001	8684.9	1100	88.0	76.7	88.0	76.3	90.1	70.9	7708	88.0
2002	9100.8	1100	91.8	77.4	91.8	77.0	94.4	72.0	8042	91.8
2003	9912.5	1100	100.0	78.4	100.0	78.0	102.9	73.4	8760	100.0
2004	8238.5	1100	83.4	78.6	83.4	78.2	85.3	73.9	7321	83.3



2005	8968.6	1100	90.9	79.1	90.9	78.7	93.1	74.7	7963	90.9
2006	9967.2	1100	100.0	79.9	100.0	79.6	103.4	75.8	8760	100.0
2007	7656.1	1100	78.2	79.9	78.2	79.5	79.5	75.9	6852	78.2
2008	8364.4	1100	84.4	80.0	84.4	79.7	86.6	76.3	7412	84.4
2009	9999.1	1100	100.0	80.7	100.0	80.4	103.8	77.2	8760	100.0
2010	8835.7	1100	88.8	81.0	88.8	80.7	91.7	77.7	7778	88.8
2011	9081.9	1129	91.2	81.3	91.2	81.0	93.6	78.3	7979	91.1
2012	10114.0	1129	100.0	81.9	100.0	81.6	102.0	79.0	8784	100.0
2013	8780.5	1158	88.7	82.1	88.7	81.9	86.5	79.3	7740	88.3
2014	8227.6	1158	82.1	82.1	82.1	81.9	81.1	79.3	7194	82.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					455	
C. Inspection, maintenance or repair combined with refuelling	1565			852		
D. Inspection, maintenance or repair without refuelling				120	0	
E. Testing of plant systems or components				16	0	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				1		
H. Nuclear regulatory requirements					7	
L. Human factor related					2	
Z. Other				10	3	22
Subtotal	1565	0	0	999	467	22
Total		1565			1488	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		35
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		18
14. Safety Systems		23
15. Reactor Cooling Systems		65
16. Steam generation systems		68
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		45
32. Feedwater and Main Steam System		140
41. Main Generator Systems		4
42. Electrical Power Supply Systems		11
XX. Miscellaneous Systems		22
Total	0	449

## US-370 MCGUIRE-2

Operator: DUKEENER (Duke Energy Corp.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1158.0 MW(e)  
 Design Net Capacity: 1180.0 MW(e)  
 Design Discharge Burnup: 40600 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 9362.5 GW(e)·h  
 Energy Availability Factor: 90.8%  
 Load Factor: 92.3%  
 Operating Factor: 90.8%  
 Energy Unavailability Factor: 9.2%  
 Total Off-line Time: 804 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	881.8	797.8	596.4	150.2	884.4	849.0	868.4	867.0	841.4	881.6	857.6	886.8	9362.5
EAF (%)	100.0	100.0	68.2	21.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.8
UCF (%)	100.0	100.0	68.2	21.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.8
LF (%)	102.4	102.5	69.3	18.0	102.7	101.8	100.8	100.6	100.9	102.3	102.7	102.9	92.3
OF (%)	100.0	100.0	68.2	21.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.8
EUf (%)	0.0	0.0	31.8	78.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.2
PUf (%)	0.0	0.0	31.8	78.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Apr 1971      Lifetime Generation: 258328.5 GW(e)·h  
 Date of First Criticality: 08 May 1983      Cumulative Energy Availability Factor: 85.5%  
 Date of Grid Connection: 23 May 1983      Cumulative Load Factor: 85.1%  
 Date of Commercial Operation: 01 Mar 1984      Cumulative Unit Capability Factor: 85.5%  
    Cumulative Energy Unavailability Factor: 14.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	6557.8	1171	83.0	83.0	83.0	83.0	75.7	75.7	6086	82.9
1985	5609.3	1180	61.0	71.0	61.0	71.0	54.3	64.0	5171	59.0
1986	6216.6	1150	64.5	68.8	64.5	68.8	61.7	63.2	5601	63.9
1987	7577.4	1150	80.2	71.7	80.2	71.7	75.2	66.3	6954	79.4
1988	8058.0	1129	82.3	73.9	82.3	73.9	81.3	69.3	7229	82.3
1989	7418.3	1129	78.4	74.6	78.4	74.6	75.0	70.3	6867	78.4
1990	6496.2	1129	69.5	73.9	69.5	73.9	65.7	69.6	5873	67.0
1991	9516.0	1129	97.6	76.9	97.6	76.9	96.2	73.0	8548	97.6
1992	6785.0	1129	70.0	76.1	70.0	76.1	68.4	72.5	6141	69.9
1993	6821.1	1129	72.8	75.8	72.8	75.8	69.0	72.1	6378	72.8
1994	8660.0	1129	88.0	76.9	88.0	76.9	87.6	73.5	7708	88.0
1995	9090.0	1129	93.0	78.2	93.0	78.2	91.9	75.1	8144	93.0
1996	7265.1	1129	74.6	77.9	74.6	77.9	73.3	74.9	6543	74.5
1997	6648.4	1129	71.0	77.4	71.0	77.4	67.2	74.4	6214	70.9
1998	9928.3	1119	99.5	78.9	99.5	78.9	101.3	76.1	8715	99.5
1999	8596.7	1100	90.5	79.6	90.5	79.6	89.2	76.9	7927	90.5
2000	8452.4	1100	88.3	80.1	88.3	80.1	87.5	77.6	7757	88.3
2001	9878.0	1100	99.3	81.2	99.3	81.2	102.5	78.9	8698	99.3
2002	8913.5	1100	90.7	81.7	90.7	81.7	92.5	79.6	7940	90.6
2003	9027.8	1100	91.6	82.1	91.6	82.1	93.7	80.3	8024	91.6
2004	9994.0	1100	100.0	83.0	100.0	83.0	103.4	81.4	8784	100.0
2005	8545.6	1100	86.7	83.1	86.7	83.1	88.7	81.7	7589	86.6
2006	8430.3	1100	84.7	83.2	84.7	83.2	87.5	82.0	7418	84.7
2007	9967.6	1100	100.0	83.9	100.0	83.9	103.4	82.8	8760	100.0

2008	8713.3	1100	87.1	84.0	87.1	84.0	90.2	83.1	7651	87.1
2009	9015.7	1100	90.3	84.3	90.3	84.3	93.6	83.5	7907	90.3
2010	10014.7	1100	100.0	84.8	100.0	84.8	103.9	84.3	8760	100.0
2011	8773.2	1129	88.2	85.0	88.2	85.0	89.3	84.5	7705	88.0
2012	7878.6	1129	78.8	84.7	78.8	84.7	79.4	84.3	6923	78.8
2013	10117.1	1158	100.0	85.3	100.0	85.3	99.7	84.8	8760	100.0
2014	9362.5	1158	90.8	85.5	90.8	85.5	92.3	85.1	7956	90.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					223	
C. Inspection, maintenance or repair combined with refuelling	804			915		
D. Inspection, maintenance or repair without refuelling				83	0	
E. Testing of plant systems or components				0	0	
H. Nuclear regulatory requirements					9	
L. Human factor related					3	
Z. Other				0	3	
Subtotal	804	0	0	998	238	0
Total		804			1236	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		17
14. Safety Systems		14
15. Reactor Cooling Systems		61
16. Steam generation systems		12
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		6
32. Feedwater and Main Steam System		36
41. Main Generator Systems		39
42. Electrical Power Supply Systems		6
XX. Miscellaneous Systems		1
Total	0	218

## US-336 MILLSTONE-2

**Operator:** DOMINION (Dominion Generation)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 869.0 MW(e)  
**Design Net Capacity:** 870.0 MW(e)  
**Design Discharge Burnup:** 33000 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 6518.7 GW(e)·h  
**Energy Availability Factor:** 86.8%  
**Load Factor:** 85.6%  
**Operating Factor:** 86.0%  
**Energy Unavailability Factor:** 13.2%  
**Total Off-line Time:** 1226 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	633.9	548.0	650.6	99.3	202.4	627.8	552.7	646.9	625.9	649.0	630.2	652.0	6518.7
<b>EAF (%)</b>	97.4	96.4	100.0	16.3	44.2	100.0	86.7	100.0	100.0	100.0	100.0	100.0	86.8
<b>UCF (%)</b>	97.4	96.4	100.0	16.3	44.2	100.0	86.7	100.0	100.0	100.0	100.0	100.0	86.8
<b>LF (%)</b>	98.0	93.8	100.8	15.9	31.3	100.3	85.5	100.0	100.0	100.4	100.6	100.8	85.6
<b>OF (%)</b>	97.4	96.4	100.0	16.3	35.3	100.0	86.7	100.0	100.0	100.0	100.0	100.0	86.0
<b>EUf (%)</b>	2.6	3.6	0.0	83.8	55.8	0.0	13.3	0.0	0.0	0.0	0.0	0.0	13.2
<b>PUf (%)</b>	0.0	0.0	0.0	83.8	55.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6
<b>UCLF (%)</b>	2.6	3.6	0.0	0.0	0.0	0.0	13.3	0.0	0.0	0.0	0.0	0.0	1.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Nov 1969  
**Date of First Criticality:** 17 Oct 1975  
**Date of Grid Connection:** 09 Nov 1975  
**Date of Commercial Operation:** 26 Dec 1975

**Lifetime Generation:** 201075.1 GW(e)·h  
**Cumulative Energy Availability Factor:** 69.6%  
**Cumulative Load Factor:** 68.2%  
**Cumulative Unit Capability Factor:** 70.3%  
**Cumulative Energy Unavailability Factor:** 30.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1975	115.7	851	100.0	100.0	100.0	100.0	20.9	20.9	414	55.6
1976	4543.2	780	66.4	68.9	66.4	68.9	66.3	62.9	6815	77.6
1977	4345.7	790	62.9	66.0	62.9	66.0	62.8	62.9	5756	65.7
1978	4507.2	802	64.1	65.4	64.1	65.4	64.2	63.3	5756	65.7
1979	4370.9	837	59.6	63.9	59.6	63.9	59.6	62.3	5385	61.5
1980	4884.3	864	80.8	67.4	68.2	64.8	64.4	62.8	5947	67.7
1981	6091.7	864	82.7	70.1	82.7	67.9	80.5	65.8	7229	82.5
1982	5015.6	864	70.5	70.1	70.5	68.3	66.3	65.9	6183	70.6
1983	2474.4	861	34.1	65.5	34.1	63.9	32.8	61.7	2993	34.2
1984	6608.3	860	93.4	68.7	93.4	67.2	87.5	64.6	8209	93.5
1985	3515.6	841	59.4	67.8	47.7	65.3	47.7	62.9	4322	49.3
1986	5164.9	857	72.5	68.2	72.5	66.0	68.8	63.5	6352	72.5
1987	6892.5	857	93.3	70.3	93.3	68.3	91.8	65.8	8177	93.3
1988	5735.9	860	77.2	70.9	77.2	69.0	75.9	66.6	6810	77.5
1989	4763.6	863	66.9	70.6	66.9	68.8	63.0	66.4	5705	65.1
1990	5309.9	863	72.8	70.7	72.8	69.1	70.2	66.6	6389	72.9
1991	3948.1	863	55.3	69.7	55.3	68.2	52.2	65.7	4820	55.0
1992	2725.0	870	36.1	67.7	36.1	66.3	35.6	63.9	3187	36.3
1993	6295.9	873	84.8	68.7	84.8	67.3	82.3	64.9	7431	84.8
1994	3676.5	873	49.0	67.6	49.0	66.3	48.1	64.0	4289	49.0
1995	2740.5	873	37.4	66.1	37.4	64.9	35.8	62.6	3273	37.4
1996	1046.5	871	13.7	63.5	13.7	62.4	13.7	60.2	1222	13.9
1997	0.0	871	0.0	60.6	0.0	59.5	0.0	57.4	0	0.0
1998	0.0	871	0.0	57.9	0.0	56.9	0.0	54.9	0	0.0

1999	4433.2	870	60.6	58.0	60.6	57.0	58.2	55.0	5310	60.6
2000	6268.5	872	83.7	59.1	83.7	58.1	81.8	56.1	7353	83.7
2001	7284.0	869	98.0	60.6	98.0	59.7	95.4	57.7	8587	98.0
2002	6209.3	871	83.2	61.4	83.2	60.6	81.5	58.6	7285	83.2
2003	6109.8	866	80.9	62.1	80.9	61.3	80.2	59.3	7083	80.9
2004	7596.0	877	98.8	63.4	98.8	62.6	98.7	60.7	8677	98.8
2005	6843.0	866	89.2	64.3	89.2	63.5	90.2	61.7	7812	89.2
2006	6519.5	882	85.1	65.0	85.1	64.2	84.4	62.5	7453	85.1
2007	7686.8	877	100.0	66.1	100.0	65.4	100.1	63.7	8760	100.0
2008	6619.6	877	88.2	66.8	86.5	66.0	85.9	64.3	7596	86.5
2009	6239.2	877	82.2	67.2	82.2	66.5	81.2	64.8	7196	82.1
2010	7414.6	869	98.2	68.1	97.6	67.4	97.4	65.8	8547	97.6
2011	6601.0	869	87.2	68.7	87.2	67.9	86.7	66.4	7620	87.0
2012	6342.8	869	83.9	69.1	83.9	68.4	83.1	66.8	7363	83.8
2013	7579.0	869	99.4	69.9	99.4	69.2	99.5	67.7	8711	99.4
2014	6518.7	869	86.8	70.3	86.8	69.6	85.6	68.2	7534	86.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		142			515	
C. Inspection, maintenance or repair combined with refuelling	1018			1143		
D. Inspection, maintenance or repair without refuelling				42		
E. Testing of plant systems or components				8	182	
H. Nuclear regulatory requirements					551	
J. Grid limitation, failure or grid unavailability			65			
L. Human factor related					23	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						31
Z. Other				21	5	
Subtotal	1018	142	65	1214	1276	31
Total		1225			2521	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		39
13. Reactor Auxiliary Systems		11
14. Safety Systems		14
15. Reactor Cooling Systems	43	105
16. Steam generation systems		82
31. Turbine and auxiliaries		73
32. Feedwater and Main Steam System	99	84
33. Circulating Water System		5
35. All other I&C Systems		1
41. Main Generator Systems		2
42. Electrical Power Supply Systems		74
XX. Miscellaneous Systems		19
Total	142	509

# US-423 MILLSTONE-3

Operator: DOMINION (Dominion Generation)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1218.0 MW(e)  
 Design Net Capacity: 1159.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9360.5 GW(e)·h  
 Energy Availability Factor: 90.0%  
 Load Factor: 87.7%  
 Operating Factor: 87.6%  
 Energy Unavailability Factor: 10.0%  
 Total Off-line Time: 1084 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	917.8	825.4	918.1	887.5	715.1	809.5	907.1	902.1	870.5	311.2	375.5	920.5	9360.5
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	35.2	45.2	100.0	90.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	35.2	45.2	100.0	90.0
LF (%)	101.3	100.8	101.5	101.2	78.9	92.3	100.1	99.6	99.3	34.3	42.8	101.6	87.7
OF (%)	100.0	100.0	100.0	100.0	78.4	93.6	100.0	100.0	100.0	35.2	45.2	100.0	87.6
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.8	54.8	0.0	10.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.8	54.8	0.0	10.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 09 Aug 1974      Lifetime Generation: 224427.5 GW(e)·h  
 Date of First Criticality: 23 Jan 1986      Cumulative Energy Availability Factor: 78.6%  
 Date of Grid Connection: 12 Feb 1986      Cumulative Load Factor: 77.1%  
 Date of Commercial Operation: 23 Apr 1986      Cumulative Unit Capability Factor: 78.6%  
    Cumulative Energy Unavailability Factor: 21.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	Data not provided									
1987	6748.2	1142	71.4	71.4	71.4	71.4	67.5	67.5	6235	71.2
1988	7683.6	1142	79.5	75.4	79.5	75.4	76.6	72.0	6954	79.2
1989	7082.6	1142	75.9	75.6	75.9	75.6	70.8	71.6	6636	75.8
1990	8218.2	1137	89.2	79.0	89.2	79.0	82.5	74.3	7798	89.0
1991	2876.7	1137	33.6	69.9	33.6	69.9	28.9	65.3	2850	32.5
1992	6593.8	1137	72.1	70.3	72.1	70.3	66.0	65.4	6311	71.8
1993	6502.8	1137	70.1	70.3	70.1	70.3	65.3	65.4	6106	69.7
1994	9416.2	1137	96.3	73.5	96.3	73.5	94.5	69.0	8426	96.2
1995	7993.6	1137	81.2	74.4	81.2	74.4	80.3	70.3	7083	80.9
1996	2476.7	1137	25.7	69.5	25.7	69.5	24.8	65.7	2156	24.5
1997	0.0	1137	0.0	63.2	0.0	63.2	0.0	59.8	0	0.0
1998	3392.1	1137	38.9	61.2	38.9	61.2	34.1	57.6	3402	38.8
1999	8307.5	1139	83.7	62.9	83.7	62.9	83.2	59.6	7329	83.7
2000	10125.7	1151	100.0	65.6	100.0	65.6	100.1	62.5	8784	100.0
2001	8169.7	1136	84.3	66.8	84.3	66.8	81.3	63.8	7392	84.4
2002	8746.2	1130	89.0	68.2	89.0	68.2	88.1	65.3	7803	89.1
2003	10005.7	1130	99.6	70.0	99.6	70.0	101.1	67.4	8729	99.6
2004	8983.7	1148	90.1	71.2	90.1	71.2	89.9	68.6	7905	90.0
2005	8767.0	1131	88.0	72.0	87.6	72.0	88.5	69.7	7677	87.6
2006	10111.1	1155	100.0	73.5	100.0	73.4	99.9	71.2	8760	100.0
2007	8699.4	1145	87.7	74.1	87.7	74.1	86.7	71.9	7694	87.8
2008	8850.3	1145	88.1	74.8	88.1	74.8	88.0	72.7	7739	88.1
2009	10418.2	1137	96.7	75.7	96.7	75.7	104.6	74.1	8470	96.7

2010	9335.7	1233	88.1	76.3	88.1	76.3	86.4	74.6	7623	87.0
2011	9365.7	1233	87.6	76.8	87.6	76.8	86.7	75.1	7674	87.6
2012	10776.5	1218	100.0	77.7	100.0	77.7	100.7	76.2	8784	100.0
2013	9542.4	1210	89.0	78.2	89.0	78.1	89.9	76.7	7803	89.1
2014	9360.5	1218	90.0	78.6	90.0	78.6	87.7	77.1	7676	87.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					482	
C. Inspection, maintenance or repair combined with refuelling	876			686		
D. Inspection, maintenance or repair without refuelling				55		
E. Testing of plant systems or components				2		
H. Nuclear regulatory requirements					312	
J. Grid limitation, failure or grid unavailability			206			
L. Human factor related					6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						26
Z. Other					303	
Subtotal	876	0	206	743	1103	26
Total		1082			1872	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		15
13. Reactor Auxiliary Systems		19
14. Safety Systems		160
15. Reactor Cooling Systems		37
16. Steam generation systems		31
17. Safety I&C Systems (excluding reactor I&C)		8
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		16
33. Circulating Water System		8
41. Main Generator Systems		23
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems		139
Total	0	475

# US-263 MONTICELLO

Operator: NSP (Northern States Power Co.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 578.0 MW(e)  
 Design Net Capacity: 545.0 MW(e)  
 Design Discharge Burnup: 27000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4324.0 GW(e)·h  
 Energy Availability Factor: 94.8%  
 Load Factor: 85.4%  
 Operating Factor: 94.8%  
 Energy Unavailability Factor: 5.2%  
 Total Off-line Time: 456 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	234.9	314.8	447.2	417.9	424.3	405.1	416.0	415.9	326.6	137.4	338.8	444.9	4324.0
EAF (%)	55.5	81.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.8
UCF (%)	55.5	81.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.8
LF (%)	54.6	81.0	104.1	100.4	98.7	97.3	96.7	96.7	78.5	32.0	81.3	103.5	85.4
OF (%)	55.5	81.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.8
EUf (%)	44.5	18.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	44.5	18.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 19 Jun 1967      Lifetime Generation: 169310.4 GW(e)·h  
 Date of First Criticality: 10 Dec 1970      Cumulative Energy Availability Factor: 84.6%  
 Date of Grid Connection: 05 Mar 1971      Cumulative Load Factor: 80.1%  
 Date of Commercial Operation: 30 Jun 1971      Cumulative Unit Capability Factor: 84.6%  
    Cumulative Energy Unavailability Factor: 15.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1971	1361.1	564	100.0	100.0	100.0	100.0	46.7	46.7	2850	55.5
1972	3717.9	580	100.0	100.0	100.0	100.0	73.0	63.4	6975	79.4
1973	3271.6	580	100.0	100.0	100.0	100.0	64.4	63.8	6242	71.3
1974	2925.2	538	75.0	93.4	75.0	93.4	62.1	63.3	6567	75.0
1975	2881.4	538	61.0	86.6	61.0	86.6	61.1	62.9	6322	72.2
1976	3986.2	537	84.3	86.2	84.3	86.2	84.5	66.6	8033	91.5
1977	3570.7	536	75.9	84.7	75.9	84.7	76.0	68.0	7001	79.9
1978	3856.2	536	81.7	84.3	81.7	84.3	82.1	69.8	7638	87.2
1979	4399.7	536	93.4	85.4	93.4	85.4	93.7	72.5	8549	97.6
1980	3455.5	536	79.0	84.7	78.2	84.6	73.4	72.6	6876	78.3
1981	3262.3	536	72.3	83.6	72.3	83.5	69.5	72.3	6362	72.6
1982	2425.1	525	62.2	81.8	62.2	81.7	52.7	70.7	5543	63.3
1983	4147.7	525	96.3	82.9	96.3	82.8	90.2	72.2	8438	96.3
1984	279.1	525	9.2	77.6	9.2	77.6	6.1	67.5	808	9.2
1985	4287.0	536	91.6	78.6	91.6	78.5	91.3	69.1	8028	91.6
1986	3379.9	536	78.8	78.6	78.8	78.5	72.0	69.3	6926	79.1
1987	3535.6	536	80.2	78.7	80.2	78.6	75.3	69.6	7051	80.5
1988	4573.6	536	99.7	79.9	99.7	79.8	97.1	71.2	8759	99.7
1989	2650.4	536	74.7	79.6	74.7	79.6	56.4	70.4	6578	75.1
1990	4505.9	536	96.0	80.4	96.0	80.4	96.0	71.7	8414	96.1
1991	3596.5	536	79.6	80.4	79.6	80.4	76.6	71.9	6996	79.9
1992	4453.7	536	97.0	81.2	97.0	81.1	94.6	73.0	8527	97.1
1993	3864.4	536	83.4	81.3	83.4	81.2	82.3	73.4	7322	83.6
1994	3956.2	536	85.6	81.4	85.6	81.4	84.3	73.8	7508	85.7



1995	4756.3	536	100.0	82.2	100.0	82.2	101.3	75.0	8760	100.0
1996	3872.9	541	84.8	82.3	84.8	82.3	81.4	75.2	7443	84.7
1997	3661.6	544	75.2	82.0	75.2	82.0	76.8	75.3	6609	75.4
1998	4118.9	553	87.7	82.2	87.7	82.2	84.9	75.6	7659	87.4
1999	4649.3	578	92.4	82.6	92.4	82.6	91.8	76.2	8092	92.4
2000	4251.4	578	83.5	82.6	83.5	82.6	83.7	76.5	7332	83.5
2001	3880.6	578	76.9	82.4	76.9	82.4	76.6	76.5	6774	77.3
2002	5015.6	578	98.4	83.0	98.4	83.0	99.1	77.3	8620	98.4
2003	4592.5	578	90.7	83.2	90.7	83.2	90.7	77.7	7969	91.0
2004	5034.9	578	98.9	83.7	98.9	83.7	99.2	78.4	8689	98.9
2005	4474.9	569	89.4	83.9	89.4	83.9	89.8	78.7	7826	89.3
2006	5072.6	572	100.0	84.4	100.0	84.3	101.2	79.4	8760	100.0
2007	4192.3	572	83.7	84.3	83.7	84.3	83.7	79.5	7327	83.6
2008	4878.0	572	95.6	84.7	95.6	84.6	97.1	80.0	8398	95.6
2009	4144.7	572	84.7	84.7	84.7	84.6	82.7	80.1	7421	84.7
2010	4695.1	572	97.1	85.0	97.1	85.0	93.7	80.4	8504	97.1
2011	3358.5	572	69.0	84.6	69.0	84.6	67.0	80.1	6045	69.0
2012	4890.4	578	97.4	84.9	97.4	84.9	96.3	80.5	8552	97.4
2013	2998.3	578	61.9	84.3	61.9	84.3	59.2	80.0	5419	61.9
2014	4324.0	578	94.8	84.6	94.8	84.6	85.4	80.1	8304	94.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		456			225	
C. Inspection, maintenance or repair combined with refuelling				979		
D. Inspection, maintenance or repair without refuelling				103		
E. Testing of plant systems or components				0	25	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements					6	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					7	
Z. Other				1	49	
Subtotal	0	456	0	1083	312	1
Total		456			1396	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems	456	8
14. Safety Systems		15
15. Reactor Cooling Systems		24
16. Steam generation systems		2
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System		46
33. Circulating Water System		0
35. All other I&C Systems		5
41. Main Generator Systems		11
42. Electrical Power Supply Systems		29
XX. Miscellaneous Systems		18
Total	456	221

# US-220 NINE MILE POINT-1

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 621.0 MW(e)

Design Net Capacity: 620.0 MW(e)

Design Discharge Burnup: 26000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5400.1 GW(e)·h

Energy Availability Factor: 100.0%

Load Factor: 99.3%

Operating Factor: 100.0%

Energy Unavailability Factor: 0.0%

Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	466.1	421.4	465.4	448.6	463.3	425.7	452.9	451.5	429.6	460.6	450.1	464.9	5400.1
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	100.9	101.0	100.9	100.3	100.3	95.2	98.0	97.7	96.1	99.7	100.5	100.6	99.3
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 12 Apr 1965      Lifetime Generation: 171058.6 GW(e)·h

Date of First Criticality: 05 Sep 1969      Cumulative Energy Availability Factor: 76.7%

Date of Grid Connection: 09 Nov 1969      Cumulative Load Factor: 72.3%

Date of Commercial Operation: 01 Dec 1969      Cumulative Unit Capability Factor: 76.7%

   Cumulative Energy Unavailability Factor: 23.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1969			Data not provided							
1970	1581.0	525	100.0	100.0	100.0	100.0	34.4	34.4	3443	39.3
1971	3033.1	592	100.0	100.0	100.0	100.0	58.5	47.2	5963	68.1
1972	3344.8	630	100.0	100.0	100.0	100.0	60.4	52.0	6101	69.5
1973	3494.2	610	76.4	93.9	76.4	93.9	65.4	55.4	6682	76.3
1974	3278.7	610	70.5	89.1	70.5	89.1	61.4	56.6	6177	70.5
1975	3044.9	610	57.0	83.6	57.0	83.6	57.0	56.7	6235	71.2
1976	4112.8	610	76.8	82.6	76.8	82.6	76.8	59.6	7724	87.9
1977	2956.8	610	55.4	79.2	55.4	79.2	55.3	59.1	5171	59.0
1978	4467.4	610	83.6	79.7	83.6	79.7	83.6	61.8	8329	95.1
1979	3005.4	610	56.2	77.3	56.2	77.3	56.2	61.3	5785	66.0
1980	4537.3	610	92.2	78.7	92.2	78.7	84.7	63.4	8097	92.2
1981	3270.3	610	65.6	77.6	65.6	77.6	61.2	63.3	5780	66.0
1982	1134.8	610	21.5	73.2	21.5	73.2	21.2	60.0	1872	21.4
1983	2802.0	610	56.2	72.0	56.2	72.0	52.4	59.4	4925	56.2
1984	3635.2	610	71.6	72.0	71.6	72.0	67.8	60.0	6316	71.9
1985	4932.3	610	96.4	73.5	96.4	73.5	92.3	62.0	8441	96.4
1986	3146.9	610	64.9	73.0	64.9	73.0	58.9	61.9	5722	65.3
1987	4615.2	610	92.8	74.1	92.8	74.1	86.4	63.2	8130	92.8
1988	0.0	610	0.0	70.2	0.0	70.2	0.0	59.9	0	0.0
1989	0.0	610	0.0	66.6	0.0	66.6	0.0	56.9	0	0.0
1990	1316.7	612	34.2	65.1	34.2	65.1	24.6	55.3	3043	34.7
1991	3873.5	615	78.2	65.7	78.2	65.7	71.9	56.1	6853	78.2
1992	2930.1	615	57.4	65.3	57.4	65.3	54.2	56.0	5052	57.5

1993	4353.4	615	84.1	66.1	84.1	66.1	80.8	57.0	7370	84.1
1994	4918.0	565	95.4	67.2	95.4	67.2	99.4	58.6	8390	95.8
1995	4127.6	565	82.9	67.8	82.9	67.8	83.4	59.5	7381	84.3
1996	4676.2	565	92.0	68.6	92.0	68.6	94.2	60.7	8133	92.6
1997	2698.6	565	51.8	68.0	51.8	68.0	54.5	60.5	4620	52.7
1998	4846.0	565	92.3	68.8	92.3	68.8	97.9	61.7	8085	92.3
1999	3564.9	565	68.4	68.8	68.4	68.8	72.0	62.0	6162	70.3
2000	4681.8	565	91.0	69.5	91.0	69.5	94.3	63.0	8060	91.8
2001	4378.0	565	83.5	69.9	83.5	69.9	88.5	63.8	7376	84.2
2002	4904.6	565	92.9	70.6	92.9	70.6	99.1	64.8	8194	93.5
2003	4361.4	565	83.6	70.9	83.6	70.9	88.1	65.4	7373	84.2
2004	4988.2	565	93.5	71.5	93.5	71.5	100.5	66.4	8258	94.0
2005	4589.8	621	87.5	72.0	87.5	72.0	84.4	66.9	7667	87.5
2006	5346.9	621	99.5	72.8	99.5	72.8	98.3	67.8	8713	99.5
2007	4762.9	621	90.3	73.3	90.3	73.3	87.6	68.3	7910	90.3
2008	5341.4	621	99.1	74.0	99.1	74.0	97.9	69.1	8707	99.1
2009	4992.6	621	93.8	74.5	93.8	74.5	91.8	69.7	8216	93.8
2010	5294.1	621	99.1	75.1	99.1	75.1	97.3	70.4	8677	99.1
2011	4595.1	621	87.6	75.4	87.6	75.4	84.5	70.8	7671	87.6
2012	4798.4	621	90.6	75.8	90.6	75.8	88.0	71.2	7951	90.5
2013	4868.8	621	90.6	76.1	90.6	76.1	89.5	71.6	7933	90.5
2014	5400.1	621	100.0	76.7	100.0	76.7	99.3	72.3	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					659	
C. Inspection, maintenance or repair combined with refuelling				1125		
D. Inspection, maintenance or repair without refuelling				124		
E. Testing of plant systems or components				2	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				2		
H. Nuclear regulatory requirements					8	
L. Human factor related					26	
Z. Other				4	122	
Subtotal	0	0	0	1257	816	0
Total	0			2073		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		18
12. Reactor I&C Systems		32
13. Reactor Auxiliary Systems		26
14. Safety Systems		105
15. Reactor Cooling Systems		288
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		9
31. Turbine and auxiliaries		78
32. Feedwater and Main Steam System		49
35. All other I&C Systems		2
41. Main Generator Systems		15
42. Electrical Power Supply Systems		28
XX. Miscellaneous Systems		2
Total	0	653

## US-410 NINE MILE POINT-2

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1276.0 MW(e)

Design Net Capacity: 1100.0 MW(e)

Design Discharge Burnup: 32300 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 9822.7 GW(e)·h

Energy Availability Factor: 88.5%

Load Factor: 87.9%

Operating Factor: 88.5%

Energy Unavailability Factor: 11.5%

Total Off-line Time: 1005 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	948.9	866.3	490.2	33.8	895.1	921.0	949.2	946.1	916.0	957.9	935.1	963.2	9822.7
EAF (%)	100.0	100.0	55.5	6.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.5
UCF (%)	100.0	100.0	55.5	6.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.5
LF (%)	99.9	101.0	51.7	3.7	94.3	100.2	100.0	99.7	99.7	100.9	101.6	101.5	87.9
OF (%)	100.0	100.0	55.5	6.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.5
EUf (%)	0.0	0.0	44.5	93.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5
PUf (%)	0.0	0.0	25.8	93.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9
UCLF (%)	0.0	0.0	18.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Aug 1975      Lifetime Generation: 217605.7 GW(e)·h

Date of First Criticality: 23 May 1987      Cumulative Energy Availability Factor: 85.1%

Date of Grid Connection: 08 Aug 1987      Cumulative Load Factor: 82.7%

Date of Commercial Operation: 11 Mar 1988      Cumulative Unit Capability Factor: 85.1%

   Cumulative Energy Unavailability Factor: 14.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	2540.6	1040	49.1	49.1	49.1	49.1	33.6	33.6	2800	38.6
1989	4288.3	1068	56.4	53.2	56.4	53.2	45.8	40.4	4824	55.1
1990	4140.4	1082	54.4	53.6	54.4	53.6	43.7	41.5	4697	53.6
1991	6562.9	1092	75.1	59.3	75.1	59.3	68.6	48.7	6484	74.0
1992	5145.0	1075	61.8	59.9	61.8	59.9	54.5	49.9	5169	58.8
1993	7191.1	1048	82.2	63.6	82.2	63.6	78.3	54.7	7195	82.1
1994	8355.9	994	93.9	67.8	93.9	67.8	96.0	60.4	8243	94.1
1995	7253.7	1061	78.9	69.2	78.9	69.2	78.0	62.6	6848	78.2
1996	8698.5	1106	89.7	71.6	89.7	71.6	89.5	65.8	7811	88.9
1997	8878.0	1105	94.9	74.1	94.9	74.1	91.7	68.5	8279	94.5
1998	7307.2	1105	80.8	74.7	80.8	74.7	75.5	69.2	7028	80.2
1999	8782.3	1128	89.1	76.0	89.1	76.0	88.9	70.9	7810	89.2
2000	8001.5	1123	81.7	76.5	81.7	76.5	81.1	71.8	7204	82.0
2001	8858.8	1119	90.7	77.5	90.7	77.5	90.4	73.1	7964	90.9
2002	8417.5	1119	85.1	78.1	85.1	78.1	85.9	74.0	7473	85.3
2003	9566.9	1119	96.4	79.2	96.4	79.2	97.6	75.6	8448	96.4
2004	8643.5	1119	88.5	79.8	88.5	79.8	87.9	76.3	7788	88.7
2005	9961.0	1135	100.0	81.0	100.0	81.0	100.2	77.7	8760	100.0
2006	9081.6	1135	92.5	81.6	92.5	81.6	91.3	78.5	8100	92.5
2007	9201.1	1140	94.6	82.3	94.6	82.3	92.1	79.2	8286	94.6
2008	9082.4	1140	91.8	82.8	91.8	82.8	90.7	79.8	8063	91.8
2009	9921.9	1142	100.0	83.6	100.0	83.6	99.2	80.7	8760	100.0
2010	8945.0	1143	90.6	83.9	90.6	83.9	89.3	81.1	7934	90.6
2011	9568.3	1119	96.4	84.4	96.4	84.4	97.6	81.8	8450	96.5

2012	8418.3	1276	81.9	84.3	81.9	84.3	80.3	81.7	7119	81.0
2013	10942.3	1277	98.4	85.0	98.4	85.0	97.8	82.4	8622	98.4
2014	9822.7	1276	88.5	85.1	88.5	85.1	87.9	82.7	7755	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		74			356	
C. Inspection, maintenance or repair combined with refuelling	865			649		
D. Inspection, maintenance or repair without refuelling				259		
E. Testing of plant systems or components				2	3	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related		65			15	
Z. Other					20	
Subtotal	865	139	0	910	394	2
Total		1004			1306	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		11
14. Safety Systems		8
15. Reactor Cooling Systems		54
16. Steam generation systems		11
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		55
33. Circulating Water System		12
35. All other I&C Systems		40
41. Main Generator Systems		26
42. Electrical Power Supply Systems	74	52
XX. Miscellaneous Systems		17
Total	74	348

**US-338 NORTH ANNA-1****Operator:** DOMINION (Dominion Generation)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP at the beginning of 2014:** 943.0 MW(e)

**Design Net Capacity:** 907.0 MW(e)

**Design Discharge Burnup:** 39000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 8279.5 GW(e)·h

**Energy Availability Factor:** 97.6%

**Load Factor:** 100.2%

**Operating Factor:** 97.6%

**Energy Unavailability Factor:** 2.4%

**Total Off-line Time:** 214 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	731.3	658.2	730.4	704.9	719.8	689.1	706.9	709.0	690.0	722.4	706.8	510.5	8279.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.2	97.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.2	97.6
<b>LF (%)</b>	104.2	103.9	104.2	103.8	102.6	101.5	100.8	101.0	101.6	103.0	104.0	72.8	100.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.2	97.6
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.8	2.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.8	2.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 19 Feb 1971      **Lifetime Generation:** 235112.8 GW(e)·h

**Date of First Criticality:** 05 Apr 1978      **Cumulative Energy Availability Factor:** 83.0%

**Date of Grid Connection:** 17 Apr 1978      **Cumulative Load Factor:** 81.1%

**Date of Commercial Operation:** 06 Jun 1978      **Cumulative Unit Capability Factor:** 83.6%

**Cumulative Energy Unavailability Factor:** 17.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1978	3664.5	896	81.4	81.4	81.4	81.4	79.5	79.5	4769	92.9
1979	4188.7	898	53.2	63.7	53.2	63.7	53.2	62.9	5399	61.6
1980	5631.0	878	87.2	72.7	87.2	72.7	73.0	66.8	7589	86.4
1981	4637.9	860	65.6	70.7	65.6	70.7	61.6	65.4	5703	65.1
1982	2397.9	865	34.7	63.0	34.7	63.0	31.6	58.1	3027	34.6
1983	5310.4	872	71.6	64.5	71.6	64.5	69.5	60.2	6277	71.7
1984	3784.8	883	50.3	62.4	50.3	62.4	48.8	58.4	4425	50.4
1985	5798.9	892	77.9	64.4	77.9	64.4	74.2	60.5	6820	77.9
1986	6310.7	893	83.7	66.7	83.7	66.7	80.7	62.9	7327	83.6
1987	3568.9	913	52.1	65.1	52.1	65.1	44.6	60.9	4523	51.6
1988	6897.3	915	88.6	67.4	88.6	67.4	85.8	63.4	7760	88.3
1989	4303.3	915	57.8	66.6	57.8	66.6	53.7	62.5	4978	56.8
1990	7233.5	912	99.6	69.3	99.6	69.3	90.5	64.8	8726	99.6
1991	5625.8	911	75.2	69.7	75.2	69.7	70.5	65.2	6549	74.8
1992	5358.1	858	81.5	70.5	81.5	70.5	71.1	65.6	7225	82.3
1993	5692.6	890	73.5	70.7	73.5	70.7	73.0	66.1	6444	73.6
1994	6795.7	900	91.6	71.9	91.6	71.9	86.2	67.3	8012	91.5
1995	7839.2	896	99.7	73.5	99.7	73.5	99.8	69.2	8733	99.7
1996	6945.5	893	91.0	74.5	91.0	74.5	88.5	70.2	7985	90.9
1997	7157.5	893	91.3	75.3	91.3	75.3	91.5	71.3	7992	91.2
1998	7217.1	893	92.4	76.2	92.4	76.2	92.3	72.3	8091	92.4
1999	8124.5	893	100.0	77.3	100.0	77.3	103.9	73.8	8760	100.0
2000	7213.1	893	91.1	77.9	91.1	77.9	92.0	74.6	7997	91.0
2001	7120.8	925	91.5	78.5	91.5	78.5	87.9	75.2	8010	91.4

2002	8164.3	925	100.0	79.4	100.0	79.4	100.8	76.2	8760	100.0
2003	6519.9	925	82.2	79.5	82.2	79.5	80.5	76.4	7200	82.2
2004	7418.4	925	91.4	80.0	91.4	80.0	91.3	77.0	8023	91.3
2005	8091.9	925	99.8	80.7	99.8	80.7	99.9	77.8	8744	99.8
2006	7142.7	924	89.8	81.0	89.8	81.0	88.2	78.2	7861	89.7
2007	7215.1	903	89.4	81.3	89.4	81.3	91.2	78.7	7854	89.7
2008	7986.8	903	100.0	81.9	100.0	81.9	100.7	79.4	8784	100.0
2009	7302.5	903	91.5	82.2	91.5	82.2	92.3	79.8	8017	91.5
2010	6779.9	903	85.6	82.3	85.6	82.3	85.7	80.0	7496	85.6
2011	6243.1	920	100.0	82.9	77.4	82.2	77.5	79.9	6746	77.0
2012	7170.9	943	86.0	83.0	86.0	82.3	87.3	80.1	7531	85.7
2013	7672.8	943	90.4	83.2	90.4	82.5	92.9	80.5	7922	90.4
2014	8279.5	943	97.6	83.6	97.6	83.0	100.2	81.1	8546	97.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1978 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		214			350	
C. Inspection, maintenance or repair combined with refuelling				940		
D. Inspection, maintenance or repair without refuelling				97		
E. Testing of plant systems or components				7	4	
L. Human factor related					4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						54
Z. Other				0	1	
Subtotal	0	214	0	1044	359	54
Total		214			1457	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1978 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		10
14. Safety Systems		15
15. Reactor Cooling Systems	214	39
16. Steam generation systems		98
31. Turbine and auxiliaries		46
32. Feedwater and Main Steam System		17
33. Circulating Water System		3
41. Main Generator Systems		8
42. Electrical Power Supply Systems		75
XX. Miscellaneous Systems		20
Total	214	345

**US-339 NORTH ANNA-2****Operator:** DOMINION (Dominion Generation)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 943.0 MW(e)

**Design Net Capacity:** 907.0 MW(e)

**Design Discharge Burnup:** 39000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 7609.2 GW(e)·h

**Energy Availability Factor:** 90.3%

**Load Factor:** 92.1%

**Operating Factor:** 90.3%

**Energy Unavailability Factor:** 9.7%

**Total Off-line Time:** 847 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	729.1	610.6	724.1	702.5	720.6	686.9	705.7	706.9	134.3	456.7	704.7	726.9	7609.2
<b>EAF (%)</b>	100.0	95.2	100.0	100.0	100.0	100.0	100.0	100.0	20.0	67.8	100.0	100.0	90.3
<b>UCF (%)</b>	100.0	95.2	100.0	100.0	100.0	100.0	100.0	100.0	20.0	67.8	100.0	100.0	90.3
<b>LF (%)</b>	103.9	96.3	103.4	103.5	102.7	101.2	100.6	100.8	19.8	65.1	103.7	103.6	92.1
<b>OF (%)</b>	100.0	95.2	100.0	100.0	100.0	100.0	100.0	100.0	20.0	67.9	100.0	100.0	90.3
<b>EUUF (%)</b>	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	80.0	32.2	0.0	0.0	9.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.0	32.2	0.0	0.0	9.3
<b>UCLF (%)</b>	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 19 Feb 1971      **Lifetime Generation:** 228048.6 GW(e)·h

**Date of First Criticality:** 12 Jun 1980      **Cumulative Energy Availability Factor:** 85.8%

**Date of Grid Connection:** 25 Aug 1980      **Cumulative Load Factor:** 83.9%

**Date of Commercial Operation:** 14 Dec 1980      **Cumulative Unit Capability Factor:** 86.6%

**Cumulative Energy Unavailability Factor:** 14.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1980	349.6	897	97.5	97.5	97.5	97.5	90.1	90.1	412	95.4
1981	5652.7	883	78.4	79.3	78.4	79.3	73.1	73.9	6813	77.8
1982	4047.2	890	57.3	68.5	57.3	68.5	51.9	63.1	4990	57.0
1983	5802.5	890	80.7	72.5	80.7	72.5	74.4	66.8	7052	80.5
1984	4717.2	890	67.1	71.2	67.1	71.2	60.3	65.2	5896	67.1
1985	6813.6	892	94.2	75.8	94.2	75.8	87.2	69.6	8252	94.2
1986	6022.1	893	82.2	76.9	82.2	76.9	77.0	70.8	7208	82.3
1987	5653.4	905	77.4	76.9	77.4	76.9	71.2	70.9	6783	77.4
1988	7884.0	915	99.2	79.8	99.2	79.8	98.1	74.3	8708	99.1
1989	5896.5	915	80.2	79.8	80.2	79.8	73.6	74.3	6887	78.6
1990	5976.6	910	80.0	79.8	80.0	79.8	74.9	74.3	6982	79.7
1991	7684.3	909	97.5	81.4	97.5	81.4	96.5	76.3	8539	97.5
1992	6324.7	909	82.6	81.5	82.6	81.5	79.2	76.6	7237	82.4
1993	6225.2	909	83.6	81.7	83.6	81.7	78.2	76.7	7303	83.4
1994	7490.3	887	97.2	82.8	97.2	82.8	96.4	78.1	8517	97.2
1995	6031.7	892	80.8	82.7	80.8	82.7	77.2	78.0	7086	80.9
1996	6121.5	897	78.1	82.4	78.1	82.4	77.7	78.0	6859	78.1
1997	7834.8	897	99.7	83.4	99.7	83.4	99.7	79.3	8738	99.7
1998	7086.1	897	92.1	83.9	91.9	83.9	90.2	79.9	8049	91.9
1999	7185.1	897	91.7	84.3	91.7	84.3	91.4	80.5	8034	91.7
2000	8018.9	897	99.4	85.0	99.4	85.0	101.8	81.5	8729	99.4
2001	5975.8	917	77.4	84.7	77.4	84.7	74.4	81.2	6776	77.4
2002	5509.7	917	68.5	83.9	68.5	83.9	68.6	80.6	6000	68.5
2003	7262.8	917	90.8	84.2	90.8	84.2	90.4	81.1	7950	90.8



2004	7388.1	917	92.0	84.6	92.0	84.5	91.7	81.5	8077	92.0
2005	7293.5	917	92.1	84.9	91.7	84.8	90.8	81.9	8034	91.7
2006	7950.4	910	99.7	85.4	99.7	85.4	99.7	82.6	8732	99.7
2007	6771.8	903	85.8	85.4	85.8	85.4	85.6	82.7	7524	85.9
2008	6446.6	903	81.2	85.3	81.2	85.3	81.3	82.6	7132	81.2
2009	7900.1	903	99.2	85.8	99.2	85.8	99.9	83.2	8688	99.2
2010	6619.5	943	81.6	85.6	81.6	85.6	81.3	83.2	7093	81.0
2011	6275.4	943	100.0	86.1	74.8	85.2	76.0	82.9	6570	75.0
2012	8162.3	943	96.5	86.4	96.5	85.6	98.5	83.4	8474	96.5
2013	7332.5	943	87.2	86.5	87.2	85.7	88.8	83.6	7642	87.2
2014	7609.2	943	90.3	86.6	90.3	85.8	92.1	83.9	7913	90.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1980 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		32			236	
C. Inspection, maintenance or repair combined with refuelling	815			758		
D. Inspection, maintenance or repair without refuelling				60		
E. Testing of plant systems or components				2		
L. Human factor related					10	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						70
Z. Other					51	
Subtotal	815	32	0	820	297	70
Total		847			1187	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1980 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		2
14. Safety Systems		18
15. Reactor Cooling Systems		27
16. Steam generation systems		32
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System	32	17
33. Circulating Water System		0
41. Main Generator Systems		47
42. Electrical Power Supply Systems		65
XX. Miscellaneous Systems		13
Total	32	231

**US-269 OCONEE-1****Operator:** DUKEENER (Duke Energy Corp.)**Contractor:** B&W (BABCOCK & WILCOX CO.)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 846.0 MW(e)

**Design Net Capacity:** 887.0 MW(e)

**Design Discharge Burnup:** 30000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 6718.0 GW(e)·h

**Energy Availability Factor:** 90.0%

**Load Factor:** 90.6%

**Operating Factor:** 90.0%

**Energy Unavailability Factor:** 10.0%

**Total Off-line Time:** 880 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	644.3	580.4	641.6	622.1	641.5	617.8	633.0	626.6	603.9	627.9	56.8	422.0	6718.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.9	69.0	90.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.9	69.0	90.0
<b>LF (%)</b>	102.4	102.1	102.1	102.1	101.9	101.4	100.6	99.6	99.2	99.8	9.3	67.1	90.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.8	69.1	90.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.1	31.0	10.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.1	31.0	10.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 06 Nov 1967 **Lifetime Generation:** 242235.4 GW(e)·h

**Date of First Criticality:** 19 Apr 1973 **Cumulative Energy Availability Factor:** 80.9%

**Date of Grid Connection:** 06 May 1973 **Cumulative Load Factor:** 78.2%

**Date of Commercial Operation:** 15 Jul 1973 **Cumulative Unit Capability Factor:** 81.2%

**Cumulative Energy Unavailability Factor:** 19.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	1959.1	721	70.5	70.5	70.5	70.5	67.3	67.3	3350	75.9
1974	4230.3	920	100.0	92.2	100.0	92.2	52.5	56.4	5141	58.7
1975	5299.3	871	69.5	82.9	69.5	82.9	69.5	61.8	6672	76.2
1976	4003.5	871	52.4	74.0	52.4	74.0	52.3	59.0	5029	57.3
1977	3949.0	860	52.5	69.2	52.5	69.2	52.4	57.5	5455	62.3
1978	5054.4	860	67.1	68.8	67.1	68.8	67.1	59.3	6299	71.9
1979	5003.1	860	66.4	68.4	66.4	68.4	66.4	60.4	6220	71.0
1980	5118.3	860	86.3	70.8	76.2	69.5	67.8	61.4	6634	75.5
1981	3023.2	860	42.9	67.5	42.9	66.4	40.1	58.9	3657	41.7
1982	5152.8	860	73.5	68.2	73.5	67.1	68.4	59.9	6335	72.3
1983	5672.0	860	78.4	69.2	78.4	68.2	75.3	61.3	6804	77.7
1984	6173.7	860	83.6	70.4	83.6	69.5	81.7	63.1	7312	83.2
1985	7066.0	860	96.2	72.5	96.2	71.7	93.8	65.6	8424	96.2
1986	4793.9	860	70.2	72.3	70.2	71.6	63.6	65.4	5870	67.0
1987	5031.1	860	76.8	72.6	76.8	71.9	66.8	65.5	6693	76.4
1988	7192.2	846	99.5	74.3	99.5	73.7	96.8	67.5	8742	99.5
1989	5943.1	846	82.9	74.9	82.9	74.2	80.2	68.3	7264	82.9
1990	6454.8	846	88.5	75.6	88.5	75.0	87.1	69.3	7751	88.5
1991	6022.5	846	82.7	76.0	82.7	75.4	81.3	70.0	7245	82.7
1992	6277.7	846	85.3	76.5	85.3	76.0	84.5	70.7	7494	85.3
1993	6525.1	846	89.4	77.1	89.4	76.6	88.0	71.5	7833	89.4
1994	6088.7	846	83.4	77.4	83.4	76.9	82.2	72.0	7302	83.4
1995	6360.5	846	86.1	77.8	86.1	77.3	85.8	72.6	7537	86.0
1996	5567.0	846	75.2	77.7	75.2	77.2	74.9	72.7	6606	75.2

1997	3194.2	846	51.3	76.6	51.3	76.2	43.1	71.5	4482	51.2
1998	5996.4	846	82.8	76.8	82.8	76.4	80.9	71.9	7255	82.8
1999	6212.6	846	85.1	77.1	85.1	76.8	83.8	72.4	7383	84.3
2000	6312.7	846	84.8	77.4	84.8	77.1	84.9	72.8	7445	84.8
2001	6962.6	846	94.0	78.0	94.0	77.6	94.0	73.5	8210	93.7
2002	6607.5	846	88.9	78.4	88.9	78.0	89.2	74.1	7788	88.9
2003	5258.6	846	71.8	78.2	71.8	77.8	71.0	74.0	6288	71.8
2004	7260.2	846	97.3	78.8	97.3	78.4	97.7	74.7	8549	97.3
2005	6728.6	846	90.0	79.1	90.0	78.8	90.8	75.2	7879	89.9
2006	5819.4	846	78.6	79.1	78.6	78.8	78.5	75.3	6884	78.6
2007	7335.7	846	97.7	79.6	97.7	79.3	99.0	76.0	8562	97.7
2008	6222.8	846	86.1	79.8	86.1	79.5	83.7	76.2	7564	86.1
2009	6316.6	846	84.4	79.9	84.4	79.6	85.2	76.4	7393	84.4
2010	7433.8	846	99.3	80.4	99.3	80.2	100.3	77.1	8695	99.3
2011	5876.3	846	79.0	80.4	79.0	80.1	79.3	77.1	6917	79.0
2012	6702.0	846	90.0	80.6	90.0	80.4	90.2	77.5	7902	90.0
2013	7075.3	846	94.3	81.0	94.3	80.7	95.5	77.9	8260	94.3
2014	6718.0	846	90.0	81.2	90.0	80.9	90.6	78.2	7880	90.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1973 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					501	
C. Inspection, maintenance or repair combined with refuelling	880			872		
D. Inspection, maintenance or repair without refuelling				135		
E. Testing of plant systems or components				19	3	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements					32	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					1	
Z. Other					0	
Subtotal	880	0	0	1026	537	0
Total		880			1563	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1973 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		38
12. Reactor I&C Systems		54
13. Reactor Auxiliary Systems		2
14. Safety Systems		35
15. Reactor Cooling Systems		104
16. Steam generation systems		142
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries		41
32. Feedwater and Main Steam System		17
41. Main Generator Systems		14
42. Electrical Power Supply Systems		14
XX. Miscellaneous Systems		31
Total	0	497

## US-270 OCONEE-2

Operator: DUKEENER (Duke Energy Corp.)

Contractor: B&amp;W (BABCOCK &amp; WILCOX CO.)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 846.0 MW(e)  
 Design Net Capacity: 887.0 MW(e)  
 Design Discharge Burnup: 30000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7539.6 GW(e)·h  
 Energy Availability Factor: 99.4%  
 Load Factor: 101.7%  
 Operating Factor: 99.4%  
 Energy Unavailability Factor: 0.6%  
 Total Off-line Time: 49 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	652.6	590.6	652.4	631.2	649.1	625.4	639.7	634.0	611.2	586.3	622.4	644.7	7539.6
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.4	100.0	100.0	99.4
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.4	100.0	100.0	99.4
LF (%)	103.7	103.9	103.8	103.6	103.1	102.7	101.6	100.7	100.3	93.1	102.0	102.4	101.7
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.4	100.0	100.0	99.4
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.6
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 06 Nov 1967      Lifetime Generation: 244839.8 GW(e)·h  
 Date of First Criticality: 11 Nov 1973      Cumulative Energy Availability Factor: 82.9%  
 Date of Grid Connection: 05 Dec 1973      Cumulative Load Factor: 81.0%  
 Date of Commercial Operation: 09 Sep 1974      Cumulative Unit Capability Factor: 83.1%  
    Cumulative Energy Unavailability Factor: 17.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	1470.1	920	100.0	100.0	100.0	100.0	54.6	54.6	1812	61.9
1975	4970.6	871	65.2	74.3	65.2	74.3	65.1	62.4	6398	73.0
1976	4232.6	871	55.4	66.2	55.4	66.2	55.3	59.4	5483	62.4
1977	3830.0	860	50.9	61.7	50.9	61.7	50.8	56.9	5315	60.7
1978	4786.2	860	63.5	62.1	63.5	62.1	63.5	58.4	6155	70.3
1979	5968.2	860	79.2	65.3	79.2	65.3	79.2	62.2	7532	86.0
1980	3882.0	860	69.6	66.0	62.0	64.8	51.4	60.5	5397	61.4
1981	5198.9	860	81.0	68.0	81.0	67.0	69.0	61.7	7050	80.5
1982	3447.7	860	53.5	66.3	53.5	65.4	45.8	59.8	4580	52.3
1983	5147.0	860	73.2	67.0	73.2	66.2	68.3	60.7	6348	72.5
1984	7298.0	860	100.0	70.2	100.0	69.5	96.6	64.2	8784	100.0
1985	5060.0	860	76.3	70.7	76.3	70.1	67.2	64.4	6654	76.0
1986	5803.1	860	81.4	71.6	81.4	71.0	77.0	65.4	7169	81.8
1987	6228.7	860	98.0	73.6	98.0	73.0	82.7	66.7	8565	97.8
1988	5540.0	846	78.3	73.9	78.3	73.4	74.5	67.3	6880	78.3
1989	6013.1	846	83.1	74.5	83.1	74.0	81.1	68.2	7272	83.0
1990	6269.4	846	85.3	75.1	85.3	74.7	84.6	69.1	7469	85.3
1991	7427.9	846	100.0	76.5	100.0	76.1	100.2	70.9	8760	100.0
1992	5946.9	846	80.9	76.8	80.9	76.4	80.0	71.4	7103	80.9
1993	6236.3	846	83.9	77.1	83.9	76.7	84.1	72.1	7352	83.9
1994	6148.5	846	83.3	77.4	83.3	77.1	83.0	72.6	7292	83.2
1995	6973.9	846	94.3	78.2	94.3	77.9	94.1	73.6	8263	94.3
1996	4432.0	846	60.4	77.4	60.4	77.1	59.6	73.0	5304	60.4
1997	5876.8	846	79.7	77.5	79.7	77.2	79.3	73.2	6974	79.6

1998	5654.7	846	77.4	77.5	77.4	77.2	76.3	73.4	6776	77.4
1999	6257.6	846	84.2	77.8	84.2	77.5	84.4	73.8	7374	84.2
2000	7499.5	846	100.0	78.6	100.0	78.3	100.9	74.8	8784	100.0
2001	6688.4	846	89.5	79.0	89.5	78.7	90.3	75.4	7836	89.5
2002	6611.1	846	88.4	79.3	88.4	79.1	89.2	75.8	7743	88.4
2003	7568.7	846	100.0	80.0	100.0	79.8	102.1	76.7	8760	100.0
2004	5676.1	846	75.8	79.9	75.8	79.6	76.4	76.7	6652	75.7
2005	6672.3	846	89.1	80.2	89.1	79.9	90.0	77.1	7808	89.1
2006	7391.9	846	97.6	80.7	97.6	80.5	99.7	77.8	8552	97.6
2007	6769.0	846	90.0	81.0	90.0	80.8	91.3	78.2	7878	89.9
2008	6392.5	846	85.1	81.1	85.1	80.9	86.0	78.5	7470	85.0
2009	7607.0	846	100.0	81.6	100.0	81.4	102.6	79.1	8760	100.0
2010	6734.3	846	89.4	81.9	89.4	81.6	90.9	79.5	7829	89.4
2011	6858.7	846	92.4	82.1	92.4	81.9	92.5	79.8	8097	92.4
2012	7537.0	846	99.7	82.6	99.7	82.4	101.4	80.4	8756	99.7
2013	6396.6	846	85.1	82.7	85.1	82.5	86.3	80.5	7455	85.1
2014	7539.6	846	99.4	83.1	99.4	82.9	101.7	81.0	8711	99.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					479	
C. Inspection, maintenance or repair combined with refuelling				848		
D. Inspection, maintenance or repair without refuelling	49			58		
E. Testing of plant systems or components				5	3	
H. Nuclear regulatory requirements					25	
L. Human factor related					1	
Z. Other					0	
Subtotal	49	0	0	911	508	0
Total		49			1419	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		35
12. Reactor I&C Systems		51
13. Reactor Auxiliary Systems		9
14. Safety Systems		38
15. Reactor Cooling Systems		90
16. Steam generation systems		96
31. Turbine and auxiliaries		129
32. Feedwater and Main Steam System		6
33. Circulating Water System		1
41. Main Generator Systems		6
42. Electrical Power Supply Systems		14
Total	0	475

# US-287 OCONEE-3

Operator: DUKEENER (Duke Energy Corp.)

Contractor: B&amp;W (BABCOCK &amp; WILCOX CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 846.0 MW(e)  
 Design Net Capacity: 887.0 MW(e)  
 Design Discharge Burnup: 30000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6935.8 GW(e)·h  
 Energy Availability Factor: 91.6%  
 Load Factor: 93.6%  
 Operating Factor: 91.6%  
 Energy Unavailability Factor: 8.4%  
 Total Off-line Time: 738 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	651.1	588.9	647.9	278.1	338.5	626.3	644.6	639.2	617.4	621.4	629.7	652.7	6935.8
EAF (%)	100.0	100.0	100.0	46.4	54.9	100.0	100.0	100.0	100.0	97.8	100.0	100.0	91.6
UCF (%)	100.0	100.0	100.0	46.4	54.9	100.0	100.0	100.0	100.0	97.8	100.0	100.0	91.6
LF (%)	103.5	103.6	103.1	45.7	53.8	102.8	102.4	101.6	101.4	98.7	103.2	103.7	93.6
OF (%)	100.0	100.0	100.0	46.4	54.8	100.0	100.0	100.0	100.0	97.8	100.0	100.0	91.6
EUf (%)	0.0	0.0	0.0	53.6	45.1	0.0	0.0	0.0	0.0	2.2	0.0	0.0	8.4
PUf (%)	0.0	0.0	0.0	53.6	44.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1
UCLF (%)	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 06 Nov 1967      Lifetime Generation: 241360.8 GW(e)·h  
 Date of First Criticality: 05 Sep 1974      Cumulative Energy Availability Factor: 81.6%  
 Date of Grid Connection: 18 Sep 1974      Cumulative Load Factor: 80.8%  
 Date of Commercial Operation: 16 Dec 1974      Cumulative Unit Capability Factor: 81.9%  
    Cumulative Energy Unavailability Factor: 18.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	Data not provided									
1975	5037.4	871	66.1	66.1	66.1	66.1	66.0	66.0	6761	77.2
1976	4758.0	871	62.3	64.2	62.3	64.2	62.2	64.1	6072	69.1
1977	5268.7	860	69.9	66.1	69.9	66.1	69.9	66.0	6545	74.7
1978	6064.3	860	80.5	69.6	80.5	69.6	80.5	69.6	7444	85.0
1979	3278.9	860	43.5	64.4	43.5	64.4	43.5	64.4	4038	46.1
1980	5224.6	860	84.8	67.8	73.8	66.0	69.2	65.2	6414	73.0
1981	5641.4	860	78.6	69.4	78.6	67.8	74.9	66.6	6835	78.0
1982	2128.4	860	33.5	64.9	33.5	63.5	28.3	61.8	2826	32.3
1983	7099.1	860	96.5	68.4	96.5	67.2	94.2	65.4	8436	96.3
1984	5355.5	860	74.2	69.0	74.2	67.9	70.9	66.0	6474	73.7
1985	4860.8	860	69.7	69.0	69.7	68.0	64.5	65.8	6071	69.3
1986	6064.3	860	90.0	70.8	90.0	69.9	80.5	67.0	7781	88.8
1987	5094.4	860	69.8	70.7	69.8	69.9	67.6	67.1	6068	69.3
1988	5965.8	846	81.9	71.5	81.9	70.7	80.3	68.0	7190	81.9
1989	6337.4	846	86.6	72.5	86.6	71.8	85.5	69.2	7585	86.6
1990	7427.8	846	99.5	74.1	99.5	73.5	100.2	71.1	8712	99.5
1991	5594.6	846	86.6	74.9	86.6	74.2	75.5	71.3	6691	76.4
1992	5448.2	846	75.5	74.9	75.5	74.3	73.3	71.4	6634	75.5
1993	7393.8	846	98.7	76.1	98.7	75.6	99.8	72.9	8647	98.7
1994	5670.8	846	77.5	76.2	77.5	75.7	76.5	73.1	6781	77.4
1995	6467.8	846	87.1	76.7	87.1	76.2	87.3	73.8	7625	87.0
1996	5454.0	846	73.2	76.6	73.2	76.1	73.4	73.7	6429	73.2
1997	4652.6	846	64.6	76.0	64.6	75.6	62.8	73.3	5633	64.3

1998	5786.4	846	80.1	76.2	80.1	75.8	78.1	73.5	7026	80.2
1999	7369.5	846	99.0	77.1	99.0	76.7	99.4	74.5	8676	99.0
2000	6577.8	846	88.0	77.5	88.0	77.1	88.5	75.0	7729	88.0
2001	5398.5	846	72.6	77.3	72.6	76.9	72.8	75.0	6355	72.5
2002	7465.5	846	99.2	78.1	99.2	77.7	100.7	75.9	8688	99.2
2003	6318.0	846	85.2	78.4	85.2	78.0	85.3	76.2	7467	85.2
2004	5747.0	846	76.3	78.3	76.3	77.9	77.3	76.2	6698	76.3
2005	7237.0	846	95.9	78.9	95.9	78.5	97.6	76.9	8395	95.8
2006	6716.2	846	89.1	79.2	89.1	78.8	90.6	77.3	7804	89.1
2007	6461.9	846	85.6	79.4	85.6	79.0	87.2	77.6	7498	85.6
2008	7575.1	846	99.2	79.9	99.2	79.6	101.9	78.3	8717	99.2
2009	6974.7	846	91.8	80.3	91.8	80.0	94.1	78.8	8041	91.8
2010	6778.5	846	90.1	80.6	90.1	80.2	91.5	79.1	7889	90.1
2011	7602.4	846	99.7	81.1	99.7	80.8	102.6	79.8	8730	99.7
2012	6411.9	846	85.1	81.2	85.1	80.9	86.3	79.9	7469	85.0
2013	7553.2	846	99.3	81.6	99.3	81.4	101.9	80.5	8700	99.3
2014	6935.8	846	91.6	81.9	91.6	81.6	93.6	80.8	8022	91.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		24			446	
C. Inspection, maintenance or repair combined with refuelling	713			846		
D. Inspection, maintenance or repair without refuelling				107	0	
E. Testing of plant systems or components				10	4	
H. Nuclear regulatory requirements					93	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						0
L. Human factor related					2	
Z. Other				0	12	
Subtotal	713	24	0	963	557	0
Total		737			1520	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		78
13. Reactor Auxiliary Systems		31
14. Safety Systems		20
15. Reactor Cooling Systems		60
16. Steam generation systems		114
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries	24	59
32. Feedwater and Main Steam System		20
41. Main Generator Systems		6
42. Electrical Power Supply Systems		5
XX. Miscellaneous Systems		31
Total	24	441

# US-219 OYSTER CREEK

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 619.0 MW(e)

Design Net Capacity: 650.0 MW(e)

Design Discharge Burnup: 43000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4833.5 GW(e)·h

Energy Availability Factor: 89.7%

Load Factor: 89.1%

Operating Factor: 89.7%

Energy Unavailability Factor: 10.3%

Total Off-line Time: 901 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	468.9	423.2	466.8	441.4	456.5	435.1	341.6	448.3	192.7	226.3	458.6	474.0	4833.5
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	79.4	100.0	46.7	51.0	100.0	100.0	89.7
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	79.4	100.0	46.7	51.0	100.0	100.0	89.7
LF (%)	101.8	101.7	101.5	99.0	99.1	97.6	74.2	97.3	43.2	49.1	102.7	102.9	89.1
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	79.4	100.0	46.7	51.1	100.0	100.0	89.7
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	20.6	0.0	53.3	49.0	0.0	0.0	10.3
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.3	49.0	0.0	0.0	8.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	20.6	0.0	0.0	0.0	0.0	0.0	1.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 15 Dec 1964      Lifetime Generation: 177370.9 GW(e)·h

Date of First Criticality: 03 May 1969      Cumulative Energy Availability Factor: 77.2%

Date of Grid Connection: 23 Sep 1969      Cumulative Load Factor: 72.6%

Date of Commercial Operation: 01 Dec 1969      Cumulative Unit Capability Factor: 77.2%

   Cumulative Energy Unavailability Factor: 22.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1969			Data not provided							
1970	3591.0	540	100.0	100.0	100.0	100.0	75.9	75.9	6788	77.5
1971	3972.6	595	100.0	100.0	100.0	100.0	76.2	76.1	7046	80.4
1972	4503.8	670	100.0	100.0	100.0	100.0	76.5	76.2	7137	81.3
1973	3589.0	620	73.8	93.3	73.8	93.3	66.1	73.6	6401	73.1
1974	3679.6	650	66.6	87.7	66.6	87.7	64.6	71.7	6163	70.4
1975	3148.7	610	59.1	82.9	59.1	82.9	58.9	69.6	6414	73.2
1976	3860.1	620	70.9	81.2	70.9	81.2	70.9	69.8	6966	79.3
1977	3249.2	620	59.9	78.5	59.9	78.5	59.8	68.5	6136	70.0
1978	3645.7	620	66.5	77.2	66.5	77.2	67.1	68.4	6508	74.3
1979	4563.3	620	83.8	77.9	83.8	77.9	84.0	70.0	7520	85.8
1980	1957.3	620	41.8	74.6	41.8	74.6	35.9	66.8	3662	41.7
1981	2628.9	620	59.9	73.3	59.9	73.3	48.4	65.3	5237	59.8
1982	2013.0	620	62.5	72.5	62.5	72.5	37.1	63.1	5474	62.5
1983	225.5	620	11.5	68.1	11.5	68.1	4.2	58.9	1007	11.5
1984	305.2	620	9.6	64.2	9.6	64.2	5.6	55.3	842	9.6
1985	3746.0	620	74.5	64.8	74.5	64.8	69.0	56.2	6518	74.4
1986	1317.7	620	26.7	62.6	26.7	62.6	24.3	54.3	2310	26.4
1987	3113.4	620	62.0	62.6	62.0	62.6	57.3	54.5	5421	61.9
1988	3547.3	620	65.5	62.7	65.5	62.7	65.1	55.0	5749	65.4
1989	2410.1	620	53.6	62.3	53.6	62.3	44.4	54.5	4686	53.5
1990	4305.1	620	87.7	63.5	87.7	63.5	79.3	55.7	7678	87.6
1991	2954.8	619	59.0	63.3	59.0	63.3	54.5	55.6	5167	59.0
1992	4531.8	610	84.9	64.2	84.9	64.2	84.6	56.9	7463	85.0



1993	4667.5	610	87.4	65.2	87.4	65.2	87.3	58.1	7654	87.4
1994	3633.3	610	69.2	65.3	69.2	65.3	67.9	58.5	6096	69.6
1995	5194.1	619	97.2	66.5	97.2	66.5	95.8	59.9	8511	97.2
1996	4339.4	619	80.9	67.1	80.9	67.1	79.8	60.7	7104	80.9
1997	5073.3	619	93.2	68.0	93.2	68.0	93.6	61.9	8164	93.2
1998	4302.2	619	81.0	68.5	81.0	68.5	79.3	62.5	7094	81.0
1999	5388.5	619	100.0	69.5	100.0	69.5	99.4	63.7	8760	100.0
2000	3908.2	619	80.6	69.9	80.6	69.9	71.9	64.0	7073	80.5
2001	5226.4	619	97.0	70.7	97.0	70.7	96.4	65.0	8497	97.0
2002	5031.3	619	93.8	71.4	93.8	71.4	92.8	65.8	8215	93.8
2003	5256.3	619	96.7	72.2	96.7	72.2	96.9	66.7	8468	96.7
2004	4847.0	619	90.8	72.7	90.8	72.7	89.1	67.4	7973	90.8
2005	5374.9	619	100.0	73.5	99.4	73.4	99.1	68.3	8706	99.4
2006	4644.5	619	88.8	73.9	88.8	73.9	85.7	68.7	7775	88.8
2007	5077.9	619	96.3	74.5	96.3	74.4	93.6	69.4	8435	96.3
2008	4664.0	619	90.2	74.9	90.2	74.9	85.8	69.8	7924	90.2
2009	4978.4	614	95.0	75.4	95.0	75.4	92.6	70.4	8320	95.0
2010	4605.0	614	87.5	75.7	87.5	75.6	85.6	70.7	7661	87.5
2011	5298.4	619	98.2	76.2	97.5	76.2	97.7	71.4	8541	97.5
2012	4718.2	619	88.5	76.5	88.5	76.5	86.8	71.7	7663	87.2
2013	5116.7	619	95.0	76.9	95.0	76.9	94.4	72.3	8324	95.0
2014	4833.5	619	89.7	77.2	89.7	77.2	89.1	72.6	7859	89.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		153			527	
C. Inspection, maintenance or repair combined with refuelling	738			1227		
D. Inspection, maintenance or repair without refuelling				93	15	
E. Testing of plant systems or components	9			6	24	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements					16	
J. Grid limitation, failure or grid unavailability						6
L. Human factor related					28	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
P. Fire					1	
Z. Other					50	
Subtotal	747	153	0	1326	661	8
Total		900			1995	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		20
13. Reactor Auxiliary Systems		8
14. Safety Systems	61	142
15. Reactor Cooling Systems		135
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		25
31. Turbine and auxiliaries	91	33
32. Feedwater and Main Steam System		58
33. Circulating Water System		6
35. All other I&C Systems		5
41. Main Generator Systems		26
42. Electrical Power Supply Systems		32
XX. Miscellaneous Systems		29
Total	152	519

# US-255 PALISADES

Operator: ENTERGY (Entergy Nuclear Operations, Inc.)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 793.0 MW(e)  
 Design Net Capacity: 805.0 MW(e)  
 Design Discharge Burnup: 33205 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5830.4 GW(e)·h  
 Energy Availability Factor: 83.2%  
 Load Factor: 83.9%  
 Operating Factor: 83.2%  
 Energy Unavailability Factor: 16.8%  
 Total Off-line Time: 1474 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	352.7	0.0	286.5	590.3	603.6	447.5	591.7	587.6	575.2	601.6	586.9	606.8	5830.4
EAF (%)	59.5	0.0	50.8	100.0	100.0	81.2	100.0	100.0	100.0	100.0	100.0	100.0	83.2
UCF (%)	59.5	0.0	50.8	100.0	100.0	81.2	100.0	100.0	100.0	100.0	100.0	100.0	83.2
LF (%)	59.8	0.0	48.6	103.4	102.3	78.4	100.3	99.6	100.7	102.0	102.6	102.9	83.9
OF (%)	59.5	0.0	50.7	100.0	100.0	81.3	100.0	100.0	100.0	100.0	100.0	100.0	83.2
EUf (%)	40.5	100.0	49.2	0.0	0.0	18.8	0.0	0.0	0.0	0.0	0.0	0.0	16.8
PUf (%)	40.5	100.0	49.2	0.0	0.0	18.8	0.0	0.0	0.0	0.0	0.0	0.0	16.8
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 14 Mar 1967      Lifetime Generation: 184801.9 GW(e)·h  
 Date of First Criticality: 24 May 1971      Cumulative Energy Availability Factor: 71.4%  
 Date of Grid Connection: 31 Dec 1971      Cumulative Load Factor: 68.8%  
 Date of Commercial Operation: 31 Dec 1971      Cumulative Unit Capability Factor: 72.3%  
    Cumulative Energy Unavailability Factor: 28.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1971			Data not provided							
1972	1899.1	400	100.0	100.0	100.0	100.0	54.0	54.0	4990	56.8
1973	2411.3	700	100.0	100.0	100.0	100.0	39.3	44.7	3829	43.7
1974	93.3	722	100.0	100.0	100.0	100.0	1.5	27.6	317	3.6
1975	2427.8	684	40.5	83.8	40.5	83.8	40.5	31.1	5649	64.5
1976	2846.9	684	47.4	76.0	47.4	76.0	47.4	34.6	4847	55.2
1977	5084.6	635	90.2	78.3	90.2	78.3	91.4	44.0	8004	91.4
1978	2624.2	635	46.0	73.7	46.0	73.7	47.2	44.5	4346	49.6
1979	3433.4	635	58.7	71.9	58.7	71.9	61.7	46.6	5241	59.8
1980	2379.1	635	80.0	72.8	39.7	68.3	42.7	46.2	3764	42.9
1981	3462.7	635	55.8	71.1	55.8	67.0	62.2	47.8	5009	57.2
1982	3345.0	635	49.3	69.1	49.3	65.4	60.1	48.9	4788	54.7
1983	3770.0	635	60.1	68.3	60.1	65.0	67.8	50.5	5282	60.3
1984	811.5	635	10.0	63.9	10.0	60.8	14.5	47.7	1334	15.2
1985	5301.8	658	82.0	65.2	82.0	62.3	91.8	51.0	7342	83.8
1986	841.2	730	14.9	61.4	14.9	58.7	13.2	48.1	1323	15.1
1987	2634.4	730	45.2	60.3	45.2	57.8	41.2	47.6	3980	45.4
1988	3435.2	730	53.7	59.8	53.7	57.5	53.6	48.0	4853	55.2
1989	3637.8	730	67.4	60.3	67.4	58.1	56.9	48.6	6019	68.7
1990	3008.1	730	56.1	60.0	56.1	58.0	47.0	48.5	5073	57.9
1991	4873.8	730	75.4	60.9	75.4	59.0	76.2	50.0	6693	76.4
1992	4865.1	730	70.5	61.4	70.5	59.6	75.9	51.3	6293	71.6
1993	3545.7	730	50.4	60.8	50.4	59.1	55.4	51.5	4595	52.5
1994	4513.8	730	65.5	61.1	65.5	59.4	70.6	52.4	5860	66.9

1995	4663.5	730	73.0	61.6	73.0	60.0	72.9	53.4	6491	74.1
1996	5314.3	730	79.7	62.4	79.7	60.9	82.9	54.6	7068	80.5
1997	5803.5	730	87.6	63.4	87.6	62.0	90.8	56.1	7714	88.1
1998	5390.6	730	81.1	64.1	81.1	62.7	84.3	57.2	7142	81.5
1999	5128.4	730	78.4	64.7	78.4	63.3	80.2	58.1	6910	78.9
2000	5748.0	730	86.8	65.5	86.8	64.2	89.6	59.3	7672	87.3
2001	2355.6	730	35.2	64.4	35.2	63.2	36.8	58.5	3118	35.6
2002	6369.4	730	94.2	65.4	93.2	64.2	99.6	59.9	8187	93.5
2003	6158.2	730	90.0	66.2	90.0	65.0	96.3	61.1	7914	90.3
2004	5346.1	730	81.1	66.7	81.1	65.6	83.4	61.8	7164	81.6
2005	6645.8	767	96.4	67.7	96.4	66.6	98.9	63.0	8443	96.4
2006	5917.1	778	85.6	68.2	85.6	67.2	86.8	63.8	7498	85.6
2007	5826.0	778	84.8	68.8	84.8	67.7	85.5	64.4	7427	84.8
2008	6837.2	778	97.9	69.6	97.9	68.6	100.0	65.5	8599	97.9
2009	6118.7	778	87.9	70.2	87.9	69.2	89.8	66.2	7695	87.8
2010	6240.7	778	90.4	70.7	90.4	69.8	91.6	66.9	7915	90.4
2011	6641.0	793	96.1	71.5	96.1	70.5	95.6	67.7	8407	96.0
2012	5178.2	793	76.3	71.6	76.3	70.7	74.3	67.9	6702	76.3
2013	6041.7	793	86.4	72.0	86.4	71.1	87.0	68.4	7567	86.4
2014	5830.4	793	83.2	72.3	83.2	71.4	83.9	68.8	7286	83.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					1446	
C. Inspection, maintenance or repair combined with refuelling	1338			1036		
D. Inspection, maintenance or repair without refuelling	135			136		
E. Testing of plant systems or components				1		
H. Nuclear regulatory requirements					95	
J. Grid limitation, failure or grid unavailability						5
L. Human factor related					10	
P. Fire					0	
Z. Other					21	
Subtotal	1473	0	0	1173	1572	5
Total		1473			2750	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		138
13. Reactor Auxiliary Systems		119
14. Safety Systems		121
15. Reactor Cooling Systems		149
16. Steam generation systems		367
31. Turbine and auxiliaries		116
32. Feedwater and Main Steam System		86
33. Circulating Water System		29
35. All other I&C Systems		0
41. Main Generator Systems		50
42. Electrical Power Supply Systems		243
XX. Miscellaneous Systems		22
Total	0	1440

# US-528 PALO VERDE-1

Operator: APS (ARIZONA PUBLIC SERVICE CO.)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1311.0 MW(e)  
 Design Net Capacity: 1221.0 MW(e)  
 Design Discharge Burnup: 38000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 10350.3 GW(e)·h  
 Energy Availability Factor: 90.7%  
 Load Factor: 90.1%  
 Operating Factor: 90.7%  
 Energy Unavailability Factor: 9.3%  
 Total Off-line Time: 817 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	988.4	891.5	985.6	953.5	858.2	943.1	969.7	971.1	940.9	309.9	549.2	989.3	10350.3
EAF (%)	100.0	100.0	100.0	100.0	92.9	100.0	100.0	100.0	100.0	32.3	63.9	100.0	90.7
UCF (%)	100.0	100.0	100.0	100.0	92.9	100.0	100.0	100.0	100.0	32.3	63.9	100.0	90.7
LF (%)	101.3	101.2	101.1	101.0	88.0	99.9	99.4	99.6	99.7	31.8	58.2	101.4	90.1
OF (%)	100.0	100.0	100.0	100.0	92.9	100.0	100.0	100.0	100.0	32.3	63.9	100.0	90.7
EUf (%)	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	67.7	36.1	0.0	9.3
PUf (%)	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	67.7	36.1	0.0	9.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 25 May 1976      Lifetime Generation: 250440.1 GW(e)·h  
 Date of First Criticality: 25 May 1985      Cumulative Energy Availability Factor: 80.0%  
 Date of Grid Connection: 10 Jun 1985      Cumulative Load Factor: 78.2%  
 Date of Commercial Operation: 28 Jan 1986      Cumulative Unit Capability Factor: 80.2%  
    Cumulative Energy Unavailability Factor: 20.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	6264.7	1221	66.6	66.6	66.6	66.6	60.5	60.5	5349	63.1
1987	5268.3	1221	50.9	58.6	50.9	58.6	49.3	54.8	4500	51.4
1988	6668.7	1221	62.8	60.0	62.8	60.0	62.2	57.3	5585	63.6
1989	1796.6	1221	14.1	48.5	14.1	48.5	16.8	47.1	1522	17.4
1990	4719.5	1221	42.6	47.3	42.6	47.3	44.1	46.5	3925	44.8
1991	9312.1	1221	87.1	54.0	85.8	53.7	87.1	53.3	7567	86.4
1992	7118.8	1221	67.2	55.9	67.2	55.7	66.4	55.2	6010	68.4
1993	7514.8	1221	76.1	58.4	76.1	58.2	70.3	57.1	6665	76.1
1994	9772.5	1221	98.8	62.9	98.8	62.7	91.4	60.9	8656	98.8
1995	8526.8	1224	82.1	64.8	82.1	64.7	79.5	62.8	7244	82.7
1996	8713.0	1227	84.4	66.6	82.0	66.3	80.8	64.4	7246	82.5
1997	10737.7	1244	98.8	69.3	98.8	69.0	98.5	67.3	8658	98.8
1998	9575.0	1243	89.0	70.9	89.0	70.6	87.9	68.9	7819	89.3
1999	9653.9	1243	88.8	72.2	88.8	71.9	88.7	70.4	7774	88.7
2000	10966.6	1243	99.8	74.1	99.8	73.8	100.4	72.4	8770	99.8
2001	9559.6	1243	88.0	74.9	88.0	74.7	87.8	73.4	7712	88.0
2002	9705.0	1243	90.1	75.8	90.1	75.6	89.1	74.3	7890	90.1
2003	10587.1	1243	98.2	77.1	98.2	76.9	97.2	75.6	8604	98.2
2004	9235.8	1243	88.5	77.7	87.3	77.5	84.6	76.1	7669	87.3
2005	7212.3	1243	70.7	77.4	70.7	77.1	66.2	75.6	6194	70.7
2006	4868.2	1314	60.4	76.5	60.4	76.3	42.3	73.9	5292	60.4
2007	8844.9	1311	78.0	76.6	78.0	76.4	77.0	74.0	6834	78.0
2008	9953.1	1311	86.7	77.0	86.7	76.8	86.4	74.6	7616	86.7
2009	11589.7	1311	99.4	78.0	99.4	77.8	100.9	75.8	8707	99.4

2010	9308.0	1311	82.4	78.2	82.4	78.0	81.0	76.0	7217	82.4
2011	9525.1	1311	84.5	78.5	84.5	78.3	82.9	76.3	7400	84.5
2012	11482.2	1311	100.0	79.3	100.0	79.1	99.7	77.2	8784	100.0
2013	10481.9	1311	91.8	79.8	91.8	79.6	91.3	77.7	8044	91.8
2014	10350.3	1311	90.7	80.2	90.7	80.0	90.1	78.2	7943	90.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					463	
C. Inspection, maintenance or repair combined with refuelling	762			1069		
D. Inspection, maintenance or repair without refuelling	52			157		
E. Testing of plant systems or components	1			3	9	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						9
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					2	
Z. Other					16	
Subtotal	815	0	0	1229	496	13
Total	815			1738		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		83
13. Reactor Auxiliary Systems		3
14. Safety Systems		14
15. Reactor Cooling Systems		67
16. Steam generation systems		40
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		102
33. Circulating Water System		28
35. All other I&C Systems		1
41. Main Generator Systems		8
42. Electrical Power Supply Systems		68
XX. Miscellaneous Systems		36
Total	0	455

# US-529 PALO VERDE-2

Operator: APS (ARIZONA PUBLIC SERVICE CO.)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1314.0 MW(e)  
 Design Net Capacity: 1304.0 MW(e)  
 Design Discharge Burnup: 38000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 10394.1 GW(e)·h  
 Energy Availability Factor: 90.2%  
 Load Factor: 90.3%  
 Operating Factor: 90.2%  
 Energy Unavailability Factor: 9.8%  
 Total Off-line Time: 856 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	997.5	900.2	994.6	120.0	833.5	954.8	981.4	963.9	947.9	987.3	715.0	998.0	10394.1
EAF (%)	100.0	100.0	100.0	13.3	90.4	100.0	100.0	100.0	100.0	100.0	77.6	100.0	90.2
UCF (%)	100.0	100.0	100.0	13.3	90.4	100.0	100.0	100.0	100.0	100.0	77.6	100.0	90.2
LF (%)	102.0	101.9	101.7	12.7	85.3	100.9	100.4	98.6	100.2	101.0	75.6	102.1	90.3
OF (%)	100.0	100.0	100.0	13.3	90.5	100.0	100.0	100.0	100.0	100.0	77.6	100.0	90.2
EUf (%)	0.0	0.0	0.0	86.7	9.6	0.0	0.0	0.0	0.0	0.0	22.4	0.0	9.8
PUf (%)	0.0	0.0	0.0	86.7	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.4	0.0	1.8
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jun 1976      Lifetime Generation: 258450.4 GW(e)·h  
 Date of First Criticality: 18 Apr 1986      Cumulative Energy Availability Factor: 82.7%  
 Date of Grid Connection: 20 May 1986      Cumulative Load Factor: 82.4%  
 Date of Commercial Operation: 19 Sep 1986      Cumulative Unit Capability Factor: 82.8%  
    Cumulative Energy Unavailability Factor: 17.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986			Data not provided							
1987	8190.0	1221	77.6	77.6	77.6	77.6	76.6	76.6	6860	78.3
1988	6747.2	1221	62.6	70.1	62.6	70.1	62.9	69.7	5613	63.9
1989	4698.8	1221	44.3	61.5	44.3	61.5	43.9	61.1	4003	45.7
1990	6242.2	1221	58.6	60.8	58.6	60.8	58.4	60.4	5276	60.2
1991	8265.2	1221	76.3	63.9	76.3	63.9	77.3	63.8	6690	76.4
1992	10104.5	1221	94.9	69.0	94.9	69.0	94.2	68.9	8341	95.0
1993	5125.3	1221	50.9	66.5	50.9	66.5	47.9	65.9	4621	52.8
1994	6573.9	1221	66.8	66.5	66.8	66.5	61.5	65.3	5919	67.6
1995	9070.9	1224	84.2	68.5	84.2	68.5	84.6	67.5	7420	84.7
1996	9346.1	1227	85.5	70.2	85.5	70.2	86.7	69.4	7548	85.9
1997	9322.7	1244	87.2	71.8	87.2	71.8	85.5	70.9	7661	87.4
1998	11084.8	1243	100.0	74.1	100.0	74.1	101.8	73.5	8760	100.0
1999	9797.3	1243	89.7	75.4	89.7	75.4	90.0	74.8	7857	89.7
2000	9525.3	1243	88.2	76.3	88.2	76.3	87.2	75.7	7743	88.1
2001	10083.5	1243	91.4	77.3	91.4	77.3	92.6	76.8	8002	91.3
2002	10019.2	1243	91.1	78.2	91.1	78.2	92.0	77.8	7981	91.1
2003	8444.4	1243	77.7	78.1	77.7	78.1	77.6	77.8	6809	77.7
2004	10662.1	1335	94.9	79.1	92.6	79.0	92.0	78.6	8138	92.6
2005	9427.2	1335	83.2	79.4	83.2	79.2	80.6	78.7	7284	83.2
2006	9808.2	1314	86.0	79.7	86.0	79.6	85.2	79.1	7535	86.0
2007	10957.6	1314	95.7	80.5	95.7	80.4	95.2	79.9	8384	95.7
2008	8624.1	1314	74.9	80.3	74.9	80.1	74.7	79.6	6577	74.9
2009	9521.6	1314	82.8	80.4	82.8	80.3	82.7	79.8	7254	82.8

2010	11653.0	1314	100.0	81.2	100.0	81.1	101.2	80.7	8760	100.0
2011	10421.3	1314	90.4	81.6	90.4	81.5	90.5	81.1	7921	90.4
2012	10358.1	1314	90.6	82.0	90.6	81.9	89.7	81.5	7957	90.6
2013	11235.0	1314	96.9	82.5	96.9	82.5	97.6	82.1	8488	96.9
2014	10394.1	1314	90.2	82.8	90.2	82.7	90.3	82.4	7904	90.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1987 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		161			162	
C. Inspection, maintenance or repair combined with refuelling	694			969		
D. Inspection, maintenance or repair without refuelling				197		
E. Testing of plant systems or components	1			0		
H. Nuclear regulatory requirements					25	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					9	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Z. Other				93	6	
Subtotal	695	161	0	1259	202	6
Total		856			1467	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1987 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	161	20
13. Reactor Auxiliary Systems		5
14. Safety Systems		18
15. Reactor Cooling Systems		18
16. Steam generation systems		25
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		17
35. All other I&C Systems		1
41. Main Generator Systems		4
42. Electrical Power Supply Systems		17
XX. Miscellaneous Systems		13
Total	161	156

# US-530 PALO VERDE-3

Operator: APS (ARIZONA PUBLIC SERVICE CO.)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1312.0 MW(e)  
 Design Net Capacity: 1304.0 MW(e)  
 Design Discharge Burnup: 38000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 11579.1 GW(e)·h  
 Energy Availability Factor: 100.0%  
 Load Factor: 100.7%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.0%  
 Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	990.8	894.0	987.2	954.2	983.8	949.7	975.6	975.3	945.3	983.0	954.1	986.0	11579.1
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	101.5	101.4	101.1	101.0	100.8	100.5	99.9	99.9	100.1	100.7	101.0	101.0	100.7
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jun 1976      Lifetime Generation: 249974.1 GW(e)·h  
 Date of First Criticality: 25 Oct 1987      Cumulative Energy Availability Factor: 84.7%  
 Date of Grid Connection: 28 Nov 1987      Cumulative Load Factor: 84.1%  
 Date of Commercial Operation: 08 Jan 1988      Cumulative Unit Capability Factor: 85.0%  
    Cumulative Energy Unavailability Factor: 15.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	10035.5	1221	94.9	94.9	94.9	94.9	95.4	95.4	8177	94.9
1989	1328.0	1221	9.0	51.6	9.0	51.6	12.4	53.6	1096	12.5
1990	9636.0	1221	91.6	65.0	91.6	65.0	90.1	65.8	8048	91.9
1991	7518.5	1221	75.3	67.6	70.8	66.5	70.3	66.9	6272	71.6
1992	8386.2	1221	78.7	69.8	78.7	68.9	78.2	69.2	6923	78.8
1993	9393.9	1221	90.1	73.2	90.1	72.5	87.8	72.3	7898	90.2
1994	6824.5	1221	66.4	72.2	66.4	71.6	63.8	71.1	5920	67.6
1995	9386.8	1225	86.6	74.0	86.6	73.5	87.4	73.1	7628	87.1
1996	10789.6	1230	99.5	76.9	99.0	76.3	99.9	76.1	8699	99.0
1997	9456.1	1247	89.1	78.1	89.1	77.6	86.5	77.2	7820	89.3
1998	9600.9	1247	89.3	79.2	89.3	78.7	87.9	78.2	7835	89.4
1999	10956.5	1247	100.0	80.9	100.0	80.5	100.3	80.1	8760	100.0
2000	9888.7	1247	89.9	81.6	89.9	81.3	90.3	80.9	7898	89.9
2001	9170.4	1247	85.0	81.9	85.0	81.5	83.9	81.1	7439	84.9
2002	11137.7	1247	100.0	83.1	100.0	82.8	102.0	82.5	8760	100.0
2003	9554.7	1247	88.0	83.4	88.0	83.1	87.5	82.8	7712	88.0
2004	8223.3	1247	78.4	83.1	76.6	82.7	75.1	82.3	6729	76.6
2005	9164.0	1247	85.3	83.2	85.3	82.9	83.9	82.4	7471	85.3
2006	9335.8	1247	87.1	83.4	87.1	83.1	85.5	82.6	7625	87.0
2007	6993.7	1247	67.4	82.6	67.4	82.3	64.0	81.7	5903	67.4
2008	10673.3	1317	93.3	83.2	93.3	82.9	92.3	82.2	8197	93.3
2009	9562.6	1317	83.5	83.2	83.5	82.9	82.9	82.2	7310	83.4
2010	10239.0	1317	89.1	83.5	89.1	83.2	88.7	82.5	7801	89.1
2011	11331.5	1312	98.8	84.1	98.8	83.9	98.6	83.2	8657	98.8



2012	10093.7	1312	88.8	84.3	88.8	84.1	87.6	83.4	7797	88.8
2013	9714.1	1312	85.7	84.4	85.7	84.1	84.5	83.5	7506	85.7
2014	11579.1	1312	100.0	85.0	100.0	84.7	100.7	84.1	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					143	
C. Inspection, maintenance or repair combined with refuelling				1027		
D. Inspection, maintenance or repair without refuelling				100		
E. Testing of plant systems or components				4	7	
H. Nuclear regulatory requirements					2	
J. Grid limitation, failure or grid unavailability						6
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						30
Z. Other					1	0
Subtotal	0	0	0	1131	154	36
Total	0			1321		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems		4
14. Safety Systems		22
16. Steam generation systems		3
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		32
32. Feedwater and Main Steam System		15
41. Main Generator Systems		7
42. Electrical Power Supply Systems		26
XX. Miscellaneous Systems		17
Total	0	139

## US-277 PEACH BOTTOM-2

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1125.0 MW(e)  
 Design Net Capacity: 1065.0 MW(e)  
 Design Discharge Burnup: 48000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8641.9 GW(e)·h  
 Energy Availability Factor: 87.7%  
 Load Factor: 87.7%  
 Operating Factor: 87.7%  
 Energy Unavailability Factor: 12.3%  
 Total Off-line Time: 1075 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	879.9	792.8	863.0	849.0	856.2	815.2	824.4	825.7	755.6	432.5	0.0	747.5	8641.9
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	61.3	0.1	91.2	87.7
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	61.3	0.1	91.2	87.7
LF (%)	105.1	104.9	103.2	104.8	102.3	100.6	98.5	98.7	93.3	51.7	0.0	89.3	87.7
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	61.3	0.0	91.1	87.7
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.7	99.9	8.8	12.3
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.7	99.9	8.8	12.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 31 Jan 1968      Lifetime Generation: 287537.2 GW(e)·h  
 Date of First Criticality: 16 Sep 1973      Cumulative Energy Availability Factor: 76.8%  
 Date of Grid Connection: 18 Feb 1974      Cumulative Load Factor: 74.7%  
 Date of Commercial Operation: 05 Jul 1974      Cumulative Unit Capability Factor: 76.8%  
    Cumulative Energy Unavailability Factor: 23.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	3659.4	1053	90.5	90.5	90.5	90.5	78.9	78.9	4000	90.6
1975	5082.5	1051	55.3	67.1	55.3	67.1	55.2	63.1	6638	75.8
1976	5580.4	1051	60.5	64.4	60.5	64.4	60.4	62.1	5998	68.3
1977	4051.6	1051	44.0	58.6	44.0	58.6	44.0	56.9	4836	55.2
1978	6793.6	1051	73.8	62.0	73.8	62.0	73.8	60.7	7299	83.3
1979	8574.4	1051	92.9	67.6	92.9	67.6	93.1	66.6	8295	94.7
1980	4372.6	1051	49.9	64.9	49.9	64.9	47.4	63.6	4529	51.6
1981	6635.3	1051	78.5	66.7	78.5	66.7	72.1	64.7	6938	79.2
1982	4816.8	1051	56.5	65.5	56.5	65.5	52.3	63.3	5089	58.1
1983	4481.1	1051	49.6	63.8	49.0	63.8	48.7	61.7	4461	50.9
1984	2465.8	1051	28.9	60.5	28.9	60.4	26.7	58.4	2544	29.0
1985	2378.2	1051	28.7	57.7	28.7	57.7	25.8	55.6	2570	29.3
1986	6896.6	1051	79.8	59.5	79.8	59.4	74.9	57.1	7010	80.0
1987	1599.9	1051	16.5	56.3	16.5	56.3	17.4	54.2	1724	19.7
1988	0.0	1051	0.0	52.4	0.0	52.4	0.0	50.4	0	0.0
1989	3880.9	1051	52.3	52.4	52.3	52.4	42.2	49.9	4735	54.1
1990	6699.8	1055	78.9	54.0	78.9	54.0	72.5	51.3	6977	79.6
1991	5121.0	1055	58.8	54.3	58.8	54.3	55.4	51.5	5277	60.2
1992	5677.9	1055	64.9	54.9	64.9	54.8	61.3	52.0	5811	66.2
1993	7704.1	1053	85.9	56.5	85.9	56.4	83.5	53.6	7571	86.4
1994	7450.7	1055	88.8	58.0	88.8	58.0	80.6	55.0	7783	88.8
1995	9363.4	1093	98.2	60.0	98.2	60.0	97.8	57.0	8598	98.2
1996	7660.6	1093	93.1	61.5	93.1	61.5	79.8	58.1	8176	93.1
1997	9570.3	1093	98.9	63.1	98.9	63.1	100.0	59.9	8663	98.9

1998	7658.8	1093	90.4	64.3	90.4	64.3	80.0	60.8	7923	90.4
1999	9462.3	1093	98.6	65.7	98.6	65.7	98.8	62.3	8635	98.6
2000	8523.0	1093	93.0	66.7	93.0	66.7	88.8	63.3	8169	93.0
2001	9369.2	1093	97.8	67.9	97.8	67.9	97.9	64.6	8563	97.8
2002	8838.9	1093	93.0	68.8	93.0	68.8	92.3	65.6	8149	93.0
2003	9265.8	1112	96.3	69.8	96.3	69.8	94.9	66.7	8430	96.2
2004	8886.1	1112	91.8	70.5	91.8	70.5	91.0	67.5	8066	91.8
2005	9615.1	1112	97.8	71.4	97.8	71.4	98.7	68.5	8569	97.8
2006	9088.3	1112	93.3	72.1	93.3	72.1	93.3	69.3	8172	93.3
2007	9867.9	1112	100.0	73.0	100.0	73.0	101.6	70.3	8737	100.0
2008	8750.0	1112	90.1	73.5	90.1	73.5	89.6	70.9	7914	90.1
2009	9941.7	1112	100.0	74.3	100.0	74.3	102.1	71.8	8760	100.0
2010	9000.1	1122	93.0	74.8	93.0	74.8	91.6	72.4	8139	92.9
2011	9978.3	1122	100.0	75.5	100.0	75.5	101.5	73.2	8760	100.0
2012	8671.1	1125	89.2	75.9	89.2	75.9	87.9	73.6	7832	89.2
2013	10103.5	1125	100.0	76.5	100.0	76.5	102.5	74.3	8760	100.0
2014	8641.9	1125	87.7	76.8	87.7	76.8	87.7	74.7	7685	87.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					350	
C. Inspection, maintenance or repair combined with refuelling	1073			1147		
D. Inspection, maintenance or repair without refuelling				209		
E. Testing of plant systems or components				4	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements					132	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					5	
Z. Other				28	6	1
Subtotal	1073	0	0	1388	493	5
Total	1073			1886		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		19
13. Reactor Auxiliary Systems		14
14. Safety Systems		39
15. Reactor Cooling Systems		90
21. Fuel Handling and Storage Facilities		57
31. Turbine and auxiliaries		44
32. Feedwater and Main Steam System		26
35. All other I&C Systems		1
41. Main Generator Systems		6
42. Electrical Power Supply Systems		45
XX. Miscellaneous Systems		5
Total	0	346

# US-278 PEACH BOTTOM-3

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1138.0 MW(e)

Design Net Capacity: 1065.0 MW(e)

Design Discharge Burnup: 48000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 10125.0 GW(e)·h

Energy Availability Factor: 100.0%

Load Factor: 101.6%

Operating Factor: 100.0%

Energy Unavailability Factor: 0.0%

Total Off-line Time: 3 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	883.9	741.6	881.3	851.1	853.5	821.5	836.9	842.8	814.5	867.7	850.0	880.3	10125.0
EAF (%)	100.0	99.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	99.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	104.4	97.0	104.2	103.9	100.8	100.3	98.8	99.5	99.4	102.5	103.6	104.0	101.6
OF (%)	100.0	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 31 Jan 1968      Lifetime Generation: 286174.0 GW(e)·h

Date of First Criticality: 07 Aug 1974      Cumulative Energy Availability Factor: 77.2%

Date of Grid Connection: 01 Sep 1974      Cumulative Load Factor: 75.9%

Date of Commercial Operation: 23 Dec 1974      Cumulative Unit Capability Factor: 77.3%

   Cumulative Energy Unavailability Factor: 22.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	396.1	1073	74.9	74.9	74.9	74.9	51.4	51.4	558	75.0
1975	5282.4	1035	58.2	59.5	58.2	59.5	58.3	57.7	7520	85.8
1976	6056.8	1035	66.7	62.9	66.7	62.9	66.6	62.0	6829	77.7
1977	4787.8	1035	52.8	59.7	52.8	59.7	52.8	59.0	5450	62.2
1978	6973.6	1035	76.9	63.9	76.9	63.9	76.9	63.4	7412	84.6
1979	6110.4	1035	67.2	64.5	67.2	64.5	67.4	64.2	6500	74.2
1980	7233.4	1035	80.1	67.1	79.7	67.0	79.6	66.7	7089	80.7
1981	3171.1	1035	33.0	62.3	33.0	62.2	35.0	62.2	3201	36.5
1982	8532.3	1035	95.3	66.4	95.3	66.3	94.1	66.2	8372	95.6
1983	2465.7	1035	27.5	62.1	27.1	62.0	27.2	61.9	2714	31.0
1984	7445.5	1035	86.2	64.5	85.2	64.3	81.9	63.9	7545	85.9
1985	3320.8	1035	45.1	62.8	45.1	62.6	36.6	61.4	3988	45.5
1986	4858.8	1035	60.9	62.6	60.9	62.5	53.6	60.8	5542	63.3
1987	1507.7	1035	14.4	58.9	14.4	58.8	16.6	57.4	1658	18.9
1988	0.0	1035	0.0	54.7	0.0	54.6	0.0	53.3	0	0.0
1989	247.3	1035	0.1	51.1	0.1	51.0	2.7	50.0	472	5.4
1990	7534.1	1035	87.1	53.3	87.1	53.2	83.1	52.0	7684	87.7
1991	5118.9	1035	59.1	53.7	57.3	53.5	56.5	52.3	5212	59.5
1992	7180.9	1035	83.6	55.3	83.6	55.1	79.0	53.8	7391	84.1
1993	6314.0	1035	73.9	56.3	73.9	56.1	69.6	54.6	6594	75.3
1994	8867.4	1035	97.9	58.4	97.9	58.2	97.8	56.7	8588	98.0
1995	7172.5	1049	90.1	59.9	90.1	59.7	78.0	57.8	7929	90.5
1996	9424.7	1093	98.2	61.7	98.2	61.6	98.2	59.7	8627	98.2
1997	7566.6	1093	90.3	63.0	90.3	62.9	79.0	60.6	7909	90.3

1998	8823.6	1093	93.3	64.4	93.3	64.2	92.2	61.9	8172	93.3
1999	8558.6	1093	92.5	65.5	92.5	65.4	89.4	63.1	8100	92.5
2000	9556.8	1093	99.3	66.9	99.3	66.7	99.5	64.6	8722	99.3
2001	8524.4	1093	93.1	67.9	93.1	67.8	89.0	65.5	8153	93.1
2002	9647.4	1093	99.8	69.1	99.8	68.9	100.8	66.8	8740	99.8
2003	8937.8	1112	92.4	69.9	92.4	69.8	92.9	67.7	8089	92.3
2004	9989.1	1112	100.0	71.0	100.0	70.8	102.3	69.0	8784	100.0
2005	8848.9	1112	92.5	71.7	92.5	71.6	90.8	69.7	8105	92.5
2006	9912.7	1112	100.0	72.6	100.0	72.5	101.8	70.7	8760	100.0
2007	9030.8	1112	93.7	73.3	93.7	73.2	92.7	71.4	8207	93.7
2008	9830.5	1112	99.4	74.1	99.4	74.0	100.6	72.3	8729	99.4
2009	8668.1	1112	90.1	74.6	90.1	74.5	89.0	72.8	7888	90.0
2010	9759.3	1112	98.6	75.3	98.6	75.2	100.2	73.6	8640	98.6
2011	8873.3	1122	90.8	75.7	90.8	75.6	91.0	74.1	7952	90.8
2012	10148.4	1138	100.0	76.4	100.0	76.3	101.5	74.9	8784	100.0
2013	8673.1	1138	87.4	76.7	87.4	76.6	87.0	75.2	7656	87.4
2014	10125.0	1138	100.0	77.3	100.0	77.2	101.6	75.9	8757	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		3			318	
C. Inspection, maintenance or repair combined with refuelling				1205		
D. Inspection, maintenance or repair without refuelling				74		
E. Testing of plant systems or components				14	0	
H. Nuclear regulatory requirements					166	
J. Grid limitation, failure or grid unavailability						9
L. Human factor related					15	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						8
Z. Other				20	0	0
Subtotal	0	3	0	1313	499	17
Total		3			1829	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		22
13. Reactor Auxiliary Systems		11
14. Safety Systems		37
15. Reactor Cooling Systems		92
31. Turbine and auxiliaries		41
32. Feedwater and Main Steam System		50
33. Circulating Water System		2
41. Main Generator Systems	3	12
42. Electrical Power Supply Systems		49
Total	3	316

# US-440 PERRY-1

Operator: FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1256.0 MW(e)

Design Net Capacity: 1205.0 MW(e)

Design Discharge Burnup: 7614 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 10455.3 GW(e)·h

Energy Availability Factor: 96.9%

Load Factor: 95.0%

Operating Factor: 96.9%

Energy Unavailability Factor: 3.1%

Total Off-line Time: 270 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	949.6	825.8	906.5	911.9	875.3	898.6	925.8	917.7	873.9	700.0	728.7	941.5	10455.3
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.5	83.7	100.0	96.9
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.5	83.7	100.0	96.9
LF (%)	101.6	97.8	97.1	100.8	93.7	99.4	99.1	98.2	96.6	74.9	80.5	100.7	95.0
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.4	83.8	100.0	96.9
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	16.3	0.0	3.1
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	16.3	0.0	3.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Oct 1974      Lifetime Generation: 227440.8 GW(e)·h

Date of First Criticality: 06 Jun 1986      Cumulative Energy Availability Factor: 81.9%

Date of Grid Connection: 19 Dec 1986      Cumulative Load Factor: 79.8%

Date of Commercial Operation: 18 Nov 1987      Cumulative Unit Capability Factor: 81.9%

   Cumulative Energy Unavailability Factor: 18.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987			Data not provided							
1988	7233.8	1203	76.3	76.3	76.3	76.3	68.4	68.4	6664	75.9
1989	5357.6	1141	53.4	65.2	53.4	65.2	53.6	61.2	4776	54.5
1990	6638.9	1141	65.3	65.2	65.3	65.2	66.4	62.9	5723	65.3
1991	8975.7	1166	90.7	71.6	90.7	71.6	87.9	69.2	7949	90.7
1992	7168.6	1166	72.6	71.8	72.6	71.8	70.0	69.3	6383	72.7
1993	3973.2	1166	43.9	67.2	43.9	67.2	38.9	64.3	3853	44.0
1994	4591.9	1166	47.3	64.3	47.3	64.3	45.0	61.5	4151	47.4
1995	9112.1	1166	93.4	67.9	93.4	67.9	89.2	65.0	8174	93.3
1996	7482.0	1164	75.9	68.8	75.9	68.8	73.2	65.9	6673	76.0
1997	8151.8	1160	81.9	70.1	81.9	70.1	80.2	67.3	7178	81.9
1998	10188.9	1160	99.1	72.8	99.1	72.8	100.3	70.3	8684	99.1
1999	9124.9	1160	89.6	74.2	89.6	74.2	89.8	71.9	7850	89.6
2000	10085.7	1191	96.9	76.0	96.9	76.0	96.4	73.8	8506	96.8
2001	7781.8	1241	77.9	76.1	77.9	76.1	71.8	73.7	6708	76.6
2002	9974.8	1235	93.6	77.3	93.6	77.3	92.2	75.0	8196	93.6
2003	8553.2	1235	82.4	77.7	82.4	77.7	79.1	75.3	7217	82.4
2004	10227.3	1235	95.4	78.7	95.4	78.7	94.3	76.4	8378	95.4
2005	7667.5	1235	72.7	78.4	72.7	78.4	70.9	76.1	6363	72.6
2006	10475.4	1235	97.3	79.4	97.3	79.4	96.8	77.2	8521	97.3
2007	8058.2	1245	76.8	79.3	76.8	79.3	73.9	77.1	6704	76.5
2008	10680.6	1245	97.7	80.2	97.7	80.2	97.7	78.1	8580	97.7
2009	7345.1	1245	71.8	79.8	71.8	79.8	67.3	77.6	6284	71.7
2010	10619.7	1240	98.1	80.6	98.1	80.6	97.8	78.5	8590	98.1

2011	8569.1	1240	81.2	80.7	81.2	80.7	78.9	78.5	7115	81.2
2012	10490.3	1240	98.0	81.4	98.0	81.4	96.3	79.2	8607	98.0
2013	8448.6	1256	79.9	81.3	79.9	81.3	77.1	79.2	6981	79.7
2014	10455.3	1256	96.9	81.9	96.9	81.9	95.0	79.8	8490	96.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		270			411	
C. Inspection, maintenance or repair combined with refuelling				979		
D. Inspection, maintenance or repair without refuelling				169		
E. Testing of plant systems or components				0		
L. Human factor related					13	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					0	
Z. Other					6	
Subtotal	0	270	0	1148	430	0
Total		270			1578	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		41
13. Reactor Auxiliary Systems		1
14. Safety Systems		0
15. Reactor Cooling Systems		61
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		51
32. Feedwater and Main Steam System	117	22
33. Circulating Water System		12
35. All other I&C Systems		22
41. Main Generator Systems		25
42. Electrical Power Supply Systems	152	61
XX. Miscellaneous Systems		101
Total	269	406

# US-293 PILGRIM-1

**Operator:** ENTERGY (Entergy Nuclear Operations, Inc.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 677.0 MW(e)  
**Design Net Capacity:** 655.0 MW(e)  
**Design Discharge Burnup:** 25000 MW·d/t  
**Status at end of year:** Operational

## 2. Production Summary 2014

**Net Energy Production:** 5769.1 GW(e)·h  
**Energy Availability Factor:** 98.6%  
**Load Factor:** 97.3%  
**Operating Factor:** 98.6%  
**Energy Unavailability Factor:** 1.4%  
**Total Off-line Time:** 120 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	508.7	459.4	502.3	491.2	413.5	483.0	506.2	426.3	486.6	499.9	492.0	500.2	5769.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	83.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	83.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.6
<b>LF (%)</b>	101.0	101.0	99.9	100.8	82.1	99.1	100.5	84.6	99.8	99.2	100.8	99.3	97.3
<b>OF (%)</b>	100.0	100.0	100.0	100.0	83.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.6
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	16.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	16.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 26 Aug 1968  
**Date of First Criticality:** 16 Jun 1972  
**Date of Grid Connection:** 19 Jul 1972  
**Date of Commercial Operation:** 01 Dec 1972

**Lifetime Generation:** 172861.8 GW(e)·h  
**Cumulative Energy Availability Factor:** 73.3%  
**Cumulative Load Factor:** 69.5%  
**Cumulative Unit Capability Factor:** 73.6%  
**Cumulative Energy Unavailability Factor:** 26.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1972	304.5	678	100.0	100.0	100.0	100.0	59.6	59.6	511	68.7
1973	4074.2	655	88.1	89.1	88.1	89.1	71.0	70.1	7574	86.5
1974	1973.1	670	39.2	64.9	39.2	64.9	33.6	52.4	3435	39.2
1975	2587.3	668	44.1	58.1	44.1	58.1	44.2	49.7	6239	71.2
1976	2415.5	665	41.1	54.0	41.1	54.0	41.4	47.7	5330	60.7
1977	2652.2	670	45.2	52.2	45.2	52.2	45.2	47.2	5379	61.4
1978	4376.7	669	74.8	55.9	74.8	55.9	74.7	51.7	7276	83.1
1979	4844.6	670	82.5	59.7	82.5	59.7	82.5	56.1	7828	89.4
1980	3044.1	670	56.5	59.3	56.5	59.3	51.7	55.5	4952	56.4
1981	3444.1	670	66.0	60.0	66.0	60.0	58.7	55.9	5767	65.8
1982	3287.1	670	64.1	60.4	64.1	60.4	56.0	55.9	5597	63.9
1983	4711.9	670	87.3	62.9	87.3	62.9	80.3	58.1	7640	87.2
1984	3.5	669	1.4	57.8	1.4	57.8	0.1	53.3	34	0.4
1985	4951.0	667	93.3	60.5	91.5	60.3	84.6	55.7	8013	91.5
1986	1027.5	670	18.9	57.5	18.9	57.4	17.5	53.0	1646	18.8
1987	0.0	670	0.0	53.7	0.0	53.6	0.0	49.4	0	0.0
1988	0.0	670	0.0	50.3	0.0	50.2	0.0	46.4	0	0.0
1989	1707.8	670	56.3	50.7	56.3	50.6	29.1	45.3	4919	56.2
1990	4243.2	670	77.5	52.2	77.5	52.1	72.3	46.8	6784	77.4
1991	3424.5	670	69.9	53.1	63.7	52.7	58.3	47.4	5572	63.6
1992	4742.0	670	84.3	54.7	84.3	54.3	80.6	49.1	7400	84.2
1993	4340.8	670	79.1	55.8	78.6	55.4	74.0	50.3	6880	78.5
1994	3824.1	670	69.4	56.4	69.4	56.1	65.2	51.0	6069	69.3
1995	4485.8	670	79.5	57.4	79.5	57.1	76.4	52.1	6962	79.5



1996	5324.3	670	95.0	59.0	95.0	58.7	90.5	53.7	8345	95.0
1997	4310.4	670	78.1	59.8	78.1	59.4	73.4	54.4	6840	78.1
1998	5698.4	670	100.0	61.3	100.0	61.0	97.1	56.1	8760	100.0
1999	4473.3	670	81.6	62.1	81.6	61.7	76.2	56.8	7141	81.5
2000	5512.3	670	96.3	63.3	96.3	63.0	93.7	58.1	8454	96.2
2001	5144.0	653	90.0	64.2	90.0	63.9	89.0	59.2	7884	90.0
2002	5769.1	653	100.0	65.3	100.0	65.1	100.9	60.5	8760	100.0
2003	4977.2	684	85.8	66.0	85.8	65.7	84.7	61.3	7548	86.2
2004	5939.3	684	99.3	67.1	99.3	66.8	98.9	62.5	8721	99.3
2005	5474.0	685	93.2	67.9	93.2	67.6	91.2	63.4	8166	93.2
2006	5829.2	685	99.1	68.8	99.1	68.6	97.1	64.4	8684	99.1
2007	5119.8	685	88.8	69.4	88.8	69.2	85.3	65.0	7774	88.7
2008	5869.0	685	99.5	70.3	98.6	70.0	97.5	65.9	8656	98.5
2009	5396.0	684	91.5	70.8	91.5	70.6	90.1	66.6	8012	91.5
2010	5917.8	685	100.0	71.6	100.0	71.4	98.6	67.5	8760	100.0
2011	5085.2	685	88.0	72.0	88.0	71.8	84.7	67.9	7710	88.0
2012	5876.6	677	99.2	72.7	99.2	72.5	98.8	68.7	8714	99.2
2013	4326.5	677	81.2	72.9	81.2	72.7	72.9	68.8	6796	77.6
2014	5769.1	677	98.6	73.6	98.6	73.3	97.3	69.5	8640	98.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					530	
C. Inspection, maintenance or repair combined with refuelling				1235	2	
D. Inspection, maintenance or repair without refuelling	120			122		
E. Testing of plant systems or components				42	4	
H. Nuclear regulatory requirements					164	
J. Grid limitation, failure or grid unavailability						10
L. Human factor related					11	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						21
Z. Other					45	
Subtotal	120	0	0	1399	756	31
Total	120			2186		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		20
12. Reactor I&C Systems		28
13. Reactor Auxiliary Systems		95
14. Safety Systems		10
15. Reactor Cooling Systems		124
17. Safety I&C Systems (excluding reactor I&C)		10
31. Turbine and auxiliaries		64
32. Feedwater and Main Steam System		59
35. All other I&C Systems		2
41. Main Generator Systems		37
42. Electrical Power Supply Systems		53
XX. Miscellaneous Systems		23
Total	0	525

# US-266 POINT BEACH-1

Operator: NEXTERA (NextEra Energy Resources, LLC)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 591.0 MW(e)  
 Design Net Capacity: 497.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 4713.1 GW(e)·h  
 Energy Availability Factor: 90.8%  
 Load Factor: 91.0%  
 Operating Factor: 90.8%  
 Energy Unavailability Factor: 9.2%  
 Total Off-line Time: 804 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	447.4	403.8	420.2	391.3	432.2	431.0	446.5	439.2	432.2	41.9	411.9	415.5	4713.1
EAF (%)	100.0	100.0	100.0	91.0	98.1	100.0	100.0	100.0	100.0	9.7	98.1	94.7	90.8
UCF (%)	100.0	100.0	100.0	91.0	98.1	100.0	100.0	100.0	100.0	9.7	98.1	94.7	90.8
LF (%)	101.8	101.7	95.7	92.0	98.3	101.3	101.5	99.9	101.6	9.5	96.7	94.5	91.0
OF (%)	100.0	100.0	100.0	91.0	98.1	100.0	100.0	100.0	100.0	9.7	98.1	94.8	90.8
EUf (%)	0.0	0.0	0.0	9.0	1.9	0.0	0.0	0.0	0.0	90.3	1.9	5.3	9.2
PUf (%)	0.0	0.0	0.0	9.0	1.9	0.0	0.0	0.0	0.0	90.3	1.9	0.0	8.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.4
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 19 Jul 1967      Lifetime Generation: 156033.6 GW(e)·h  
 Date of First Criticality: 02 Nov 1970      Cumulative Energy Availability Factor: 84.1%  
 Date of Grid Connection: 06 Nov 1970      Cumulative Load Factor: 80.2%  
 Date of Commercial Operation: 21 Dec 1970      Cumulative Unit Capability Factor: 84.4%  
    Cumulative Energy Unavailability Factor: 15.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1970	Data not provided									
1971	3446.2	524	100.0	100.0	100.0	100.0	75.1	75.1	7699	87.9
1972	3085.5	524	100.0	100.0	100.0	100.0	67.0	71.1	6349	72.3
1973	2742.3	497	67.6	89.6	67.6	89.6	63.0	68.5	6867	78.4
1974	3144.3	497	81.4	87.6	81.4	87.6	72.2	69.4	7136	81.5
1975	2924.9	480	69.5	84.2	69.5	84.2	69.6	69.4	6297	71.9
1976	3392.5	492	78.4	83.2	78.4	83.2	78.5	70.9	7239	82.4
1977	3687.1	495	85.1	83.5	85.1	83.5	85.0	72.9	7733	88.3
1978	3794.5	495	87.5	84.0	87.5	84.0	87.5	74.7	7864	89.8
1979	3059.6	495	70.6	82.5	70.6	82.5	70.6	74.2	6455	73.7
1980	2479.3	495	91.0	83.4	77.0	82.0	57.0	72.5	6739	76.7
1981	2614.9	495	78.3	82.9	78.3	81.6	60.3	71.4	6834	78.0
1982	2701.7	495	81.5	82.8	81.5	81.6	62.3	70.7	7134	81.4
1983	2384.9	495	74.3	82.1	74.3	81.1	55.0	69.5	6498	74.2
1984	3109.2	485	72.6	81.5	72.6	80.5	73.0	69.7	6379	72.6
1985	3354.2	485	78.6	81.3	78.6	80.4	78.9	70.3	6917	79.0
1986	3770.1	485	88.7	81.7	88.7	80.9	88.7	71.4	7786	88.9
1987	3567.1	485	83.6	81.9	83.6	81.0	84.0	72.2	7348	83.9
1988	3831.0	485	88.5	82.2	88.5	81.4	89.9	73.1	7787	88.6
1989	3606.2	485	87.8	82.5	87.8	81.8	84.9	73.7	7706	88.0
1990	3531.7	485	83.8	82.6	83.8	81.9	83.1	74.2	7362	84.0
1991	3628.7	485	85.7	82.7	85.7	82.0	85.4	74.7	7524	85.9
1992	3605.6	485	84.1	82.8	84.1	82.1	84.6	75.2	7409	84.3
1993	3804.8	485	88.8	83.0	88.8	82.4	89.6	75.8	7799	89.0

1994	3905.1	485	92.0	83.4	92.0	82.8	91.9	76.4	8071	92.1
1995	3792.4	485	88.5	83.6	88.5	83.0	89.3	77.0	7768	88.7
1996	4003.3	485	93.0	84.0	93.0	83.4	94.0	77.6	8173	93.0
1997	853.5	485	21.3	81.7	21.3	81.1	20.1	75.5	1872	21.4
1998	2584.2	485	62.7	81.0	62.7	80.5	60.8	75.0	5489	62.7
1999	3489.3	489	80.0	81.0	80.0	80.5	81.4	75.2	7070	80.7
2000	4134.6	510	96.1	81.5	95.6	81.0	92.3	75.8	8391	95.5
2001	3702.1	510	87.0	81.7	87.0	81.2	82.9	76.0	7611	86.9
2002	3975.8	510	91.0	82.0	91.0	81.5	89.0	76.5	7964	90.9
2003	4343.0	516	97.5	82.5	97.5	82.0	96.2	77.1	8538	97.5
2004	3631.0	516	81.9	82.5	81.9	82.0	80.1	77.2	7186	81.8
2005	3641.0	512	82.6	82.5	82.6	82.0	81.2	77.3	7232	82.6
2006	4465.6	512	100.0	83.0	100.0	82.6	99.6	77.9	8760	100.0
2007	3822.3	512	86.6	83.1	86.6	82.7	85.2	78.1	7582	86.6
2008	3737.0	512	83.9	83.1	83.9	82.7	83.1	78.3	7365	83.8
2009	4385.4	512	100.0	83.5	100.0	83.2	97.8	78.8	8760	100.0
2010	3956.1	512	89.9	83.7	89.9	83.3	88.2	79.0	7870	89.8
2011	3525.0	512	79.4	83.6	79.4	83.2	78.6	79.0	6954	79.4
2012	5154.4	591	99.5	84.0	99.5	83.7	99.3	79.6	8737	99.5
2013	4707.2	591	91.1	84.2	91.1	83.9	90.9	79.9	7981	91.1
2014	4713.1	591	90.8	84.4	90.8	84.1	91.0	80.2	7956	90.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		39			134	
C. Inspection, maintenance or repair combined with refuelling	685			1036		
D. Inspection, maintenance or repair without refuelling	78			49		
E. Testing of plant systems or components				2		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirements					28	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						157
Z. Other				0	3	
Subtotal	763	39	0	1088	165	158
Total		802			1411	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		0
15. Reactor Cooling Systems		8
16. Steam generation systems		53
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System	39	21
33. Circulating Water System		1
41. Main Generator Systems		7
42. Electrical Power Supply Systems		13
XX. Miscellaneous Systems		8
Total	39	130

## US-301 POINT BEACH-2

Operator: NEXTERA (NextEra Energy Resources, LLC)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 591.0 MW(e)  
 Design Net Capacity: 497.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 4742.3 GW(e)·h  
 Energy Availability Factor: 90.9%  
 Load Factor: 91.6%  
 Operating Factor: 90.9%  
 Energy Unavailability Factor: 9.1%  
 Total Off-line Time: 798 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	446.6	403.4	228.7	164.2	446.5	431.2	446.4	415.3	431.8	446.1	434.2	447.8	4742.3
EAF (%)	100.0	100.0	51.5	43.2	100.0	100.0	100.0	96.1	100.0	100.0	100.0	100.0	90.9
UCF (%)	100.0	100.0	51.6	43.2	100.0	100.0	100.0	96.1	100.0	100.0	100.0	100.0	90.9
LF (%)	101.6	101.6	52.1	38.6	101.6	101.3	101.5	94.5	101.5	101.5	101.9	101.8	91.6
OF (%)	100.0	100.0	51.5	43.2	100.0	100.0	100.0	96.1	100.0	100.0	100.0	100.0	90.9
EUf (%)	0.0	0.0	48.5	56.8	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0	9.1
PUf (%)	0.0	0.0	48.5	56.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.8
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0	0.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 25 Jul 1968      Lifetime Generation: 154989.5 GW(e)·h  
 Date of First Criticality: 30 May 1972      Cumulative Energy Availability Factor: 85.3%  
 Date of Grid Connection: 02 Aug 1972      Cumulative Load Factor: 83.3%  
 Date of Commercial Operation: 01 Oct 1972      Cumulative Unit Capability Factor: 85.3%  
    Cumulative Energy Unavailability Factor: 14.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1972	140.4	288	100.0	100.0	100.0	100.0	84.8	84.8	1799	81.5
1973	2991.0	497	80.2	80.9	80.2	80.9	68.7	69.3	8192	93.5
1974	3179.3	497	81.0	81.0	81.0	81.0	73.0	71.1	7100	81.1
1975	3741.4	485	87.9	83.2	87.9	83.2	88.1	76.6	8224	93.9
1976	3749.2	491	86.8	84.1	86.8	84.1	86.9	79.2	7959	90.6
1977	3622.3	495	83.5	84.0	83.5	84.0	83.5	80.0	7496	85.6
1978	3858.9	495	89.0	84.8	89.0	84.8	89.0	81.5	8039	91.8
1979	3707.5	495	85.5	84.9	85.5	84.9	85.5	82.1	7728	88.2
1980	3587.9	495	88.0	85.3	88.0	85.3	82.5	82.1	7569	86.2
1981	3720.3	495	89.9	85.8	89.9	85.8	85.8	82.5	7757	88.6
1982	3605.4	495	88.2	86.1	88.2	86.1	83.1	82.6	7595	86.7
1983	3016.3	495	74.5	85.0	74.5	85.0	69.6	81.4	6245	71.3
1984	3512.4	495	86.0	85.1	86.0	85.1	80.8	81.4	7405	84.3
1985	3603.1	485	86.8	85.2	86.8	85.2	84.8	81.6	7491	85.5
1986	3417.6	485	82.1	85.0	82.1	85.0	80.4	81.5	7186	82.0
1987	3606.1	485	85.9	85.1	85.5	85.0	84.9	81.8	7478	85.4
1988	3718.7	485	88.0	85.2	88.0	85.2	87.3	82.1	7626	86.8
1989	3485.1	485	82.9	85.1	82.9	85.1	82.0	82.1	7107	81.1
1990	3793.5	485	89.1	85.3	89.1	85.3	89.3	82.5	7713	88.0
1991	3689.2	485	87.6	85.4	87.6	85.4	86.8	82.7	7569	86.4
1992	3668.2	485	86.6	85.5	86.6	85.5	86.1	82.9	7492	85.3
1993	3844.5	485	90.9	85.8	90.9	85.7	90.5	83.2	7883	90.0
1994	3752.3	485	90.3	86.0	90.3	85.9	88.3	83.5	7827	89.3
1995	3386.0	485	83.4	85.9	83.4	85.8	79.7	83.3	7158	81.7

1996	2950.3	485	78.0	85.5	78.0	85.5	69.3	82.7	6653	75.7
1997	825.5	485	21.4	83.0	21.4	83.0	19.4	80.2	1788	20.4
1998	3123.8	485	75.5	82.7	75.5	82.7	73.5	80.0	6609	75.4
1999	3578.5	498	82.6	82.7	82.6	82.7	81.9	80.0	7195	82.1
2000	3527.4	512	80.9	82.6	80.9	82.6	78.4	80.0	7094	80.8
2001	4343.0	512	98.6	83.2	98.6	83.2	96.8	80.6	8631	98.5
2002	4004.3	512	90.7	83.5	90.7	83.4	89.3	80.9	7934	90.6
2003	3713.3	518	85.6	83.5	85.6	83.5	81.9	80.9	7469	85.3
2004	4384.9	518	97.5	84.0	97.5	84.0	96.4	81.4	8559	97.4
2005	3232.6	514	72.6	83.6	72.6	83.6	71.8	81.1	6355	72.5
2006	4094.8	514	91.0	83.9	91.0	83.8	90.9	81.4	7972	91.0
2007	4462.2	514	100.0	84.3	100.0	84.3	99.1	81.9	8760	100.0
2008	4075.9	514	90.0	84.5	90.0	84.5	90.3	82.2	7904	90.0
2009	3782.5	516	85.7	84.5	85.7	84.5	83.7	82.2	7501	85.6
2010	4336.3	515	97.0	84.9	97.0	84.9	96.1	82.6	8495	97.0
2011	3450.1	586	71.9	84.5	71.9	84.5	70.8	82.3	6098	69.6
2012	4633.8	591	90.4	84.7	90.4	84.7	89.3	82.5	7935	90.3
2013	5237.7	591	100.0	85.1	100.0	85.1	101.2	83.0	8760	100.0
2014	4742.3	591	90.9	85.3	90.9	85.3	91.6	83.3	7962	90.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		29			99	
C. Inspection, maintenance or repair combined with refuelling	768			1069		
D. Inspection, maintenance or repair without refuelling				38		
E. Testing of plant systems or components				0	21	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				2		
H. Nuclear regulatory requirements					3	
L. Human factor related					6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Z. Other					15	
Subtotal	768	29	0	1109	144	0
Total		797			1253	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		26
13. Reactor Auxiliary Systems		0
14. Safety Systems		0
15. Reactor Cooling Systems	29	30
16. Steam generation systems		15
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		5
42. Electrical Power Supply Systems		7
Total	29	94

# US-282 PRAIRIE ISLAND-1

Operator: NSP (Northern States Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 522.0 MW(e)  
 Design Net Capacity: 530.0 MW(e)  
 Design Discharge Burnup: 51000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 3812.5 GW(e)·h  
 Energy Availability Factor: 82.9%  
 Load Factor: 83.4%  
 Operating Factor: 82.9%  
 Energy Unavailability Factor: 17.1%  
 Total Off-line Time: 1496 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	409.6	370.0	408.4	364.4	396.0	372.8	393.2	393.2	381.4	80.1	76.7	166.7	3812.5
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	22.7	28.5	45.6	82.9
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	22.7	28.5	45.6	82.9
LF (%)	105.5	105.5	105.3	97.0	102.0	99.2	101.2	101.2	101.5	20.6	20.4	42.9	83.4
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	22.7	28.4	45.6	82.9
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.3	71.5	54.4	17.1
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.3	71.5	0.0	12.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.4	4.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 25 Jun 1968      Lifetime Generation: 158989.8 GW(e)·h  
 Date of First Criticality: 01 Dec 1973      Cumulative Energy Availability Factor: 86.4%  
 Date of Grid Connection: 04 Dec 1973      Cumulative Load Factor: 85.5%  
 Date of Commercial Operation: 16 Dec 1973      Cumulative Unit Capability Factor: 86.4%  
    Cumulative Energy Unavailability Factor: 13.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	7.2	514	100.0	100.0	100.0	100.0	2.1	2.1	312	46.4
1974	1452.2	520	43.9	47.9	43.9	47.9	31.9	29.8	3848	43.9
1975	3694.2	520	81.2	63.9	81.2	63.9	81.1	54.5	7560	86.3
1976	3268.7	520	71.5	66.4	71.5	66.4	71.6	60.0	6801	77.4
1977	3714.5	511	82.9	70.4	82.9	70.4	83.0	65.6	7453	85.1
1978	3810.7	507	85.9	73.4	85.9	73.4	85.8	69.5	8012	91.5
1979	2910.9	503	65.8	72.2	65.8	72.2	66.1	68.9	6402	73.1
1980	3105.7	503	77.8	73.0	77.8	73.0	70.3	69.1	6863	78.1
1981	3838.6	503	88.9	74.9	88.9	74.9	87.1	71.3	7803	89.1
1982	3918.0	503	90.9	76.6	90.9	76.6	88.9	73.2	7960	90.9
1983	3888.9	503	87.2	77.7	87.2	77.7	88.3	74.7	7621	87.0
1984	4159.4	503	94.3	79.2	94.3	79.2	94.1	76.4	8285	94.3
1985	3678.5	503	83.4	79.5	83.4	79.5	83.5	77.0	7333	83.7
1986	3819.6	503	89.6	80.3	89.6	80.3	86.7	77.8	7870	89.8
1987	3590.3	503	82.2	80.4	82.2	80.4	81.5	78.0	7232	82.6
1988	3823.4	503	89.3	81.0	89.3	81.0	86.5	78.6	7800	88.8
1989	4392.3	503	99.7	82.2	99.7	82.2	99.7	79.9	8737	99.7
1990	3829.7	503	81.7	82.1	81.7	82.1	86.9	80.3	7764	88.6
1991	3987.1	505	90.5	82.6	90.5	82.6	90.1	80.8	7943	90.7
1992	3497.8	503	77.4	82.3	77.4	82.3	79.2	80.7	6844	77.9
1993	4378.0	505	96.8	83.0	96.8	83.0	98.9	81.6	8480	96.8
1994	3718.2	513	82.8	83.0	82.8	83.0	82.7	81.7	7258	82.9
1995	4519.0	513	99.9	83.8	99.9	83.8	100.6	82.6	8752	99.9
1996	3741.6	513	92.9	84.2	92.2	84.2	83.0	82.6	7327	83.4

1997	3522.8	513	79.5	84.0	79.5	84.0	78.4	82.4	6965	79.5
1998	4209.2	514	90.8	84.3	90.8	84.3	93.5	82.8	7948	90.7
1999	4068.8	522	87.2	84.4	87.2	84.4	89.0	83.1	7643	87.2
2000	4536.5	522	96.7	84.9	96.7	84.8	98.9	83.7	8499	96.8
2001	3641.7	522	78.8	84.6	78.8	84.6	79.6	83.5	6890	78.7
2002	4373.2	522	94.4	85.0	94.4	85.0	95.6	84.0	8268	94.4
2003	4596.3	522	98.4	85.4	98.4	85.4	101.0	84.5	8619	98.4
2004	3602.1	522	79.9	85.3	79.9	85.2	78.6	84.3	7017	79.9
2005	4518.4	522	96.7	85.6	96.7	85.6	98.8	84.8	8465	96.6
2006	4103.2	523	88.9	85.7	88.9	85.7	89.6	85.0	7785	88.9
2007	4457.1	551	96.7	86.1	96.7	86.0	92.3	85.2	8472	96.7
2008	4059.5	551	88.6	86.1	88.6	86.1	83.9	85.1	7780	88.6
2009	3600.2	551	79.0	85.9	79.0	85.9	74.6	84.8	6923	79.0
2010	4654.9	560	100.0	86.3	100.0	86.3	96.0	85.2	8760	100.0
2011	4128.4	521	87.7	86.4	87.7	86.4	87.2	85.2	7717	88.1
2012	3706.0	522	79.3	86.2	79.3	86.2	80.8	85.1	6961	79.2
2013	4654.7	522	99.7	86.5	99.7	86.5	101.8	85.5	8732	99.7
2014	3812.5	522	82.9	86.4	82.9	86.4	83.4	85.5	7264	82.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1973 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		404			259	
C. Inspection, maintenance or repair combined with refuelling	1090			696		
D. Inspection, maintenance or repair without refuelling				75		
E. Testing of plant systems or components				6	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements					3	
L. Human factor related					1	
P. Fire					21	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					0	
Z. Other						1
Subtotal	1090	404	0	777	284	1
Total		1494			1062	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1973 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		25
14. Safety Systems		8
15. Reactor Cooling Systems	404	6
16. Steam generation systems		33
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		108
32. Feedwater and Main Steam System		31
33. Circulating Water System		1
35. All other I&C Systems		7
41. Main Generator Systems		8
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems		3
Total	404	253

## US-306 PRAIRIE ISLAND-2

Operator: NSP (Northern States Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 518.0 MW(e)  
 Design Net Capacity: 530.0 MW(e)  
 Design Discharge Burnup: 51000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 4570.7 GW(e)·h  
 Energy Availability Factor: 97.7%  
 Load Factor: 100.7%  
 Operating Factor: 97.7%  
 Energy Unavailability Factor: 2.3%  
 Total Off-line Time: 204 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	312.1	373.5	407.8	392.6	312.4	377.2	395.7	395.1	387.2	406.6	399.4	411.3	4570.7
EAF (%)	90.0	100.0	100.0	100.0	82.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.7
UCF (%)	90.0	100.0	100.0	100.0	82.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.7
LF (%)	81.0	107.3	105.9	105.3	81.0	101.1	102.7	102.5	103.8	105.5	106.9	106.7	100.7
OF (%)	90.1	100.0	100.0	100.0	82.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.7
EUf (%)	10.0	0.0	0.0	0.0	17.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
PUf (%)	10.0	0.0	0.0	0.0	17.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 25 Jun 1969      Lifetime Generation: 157703.4 GW(e)·h  
 Date of First Criticality: 17 Dec 1974      Cumulative Energy Availability Factor: 87.9%  
 Date of Grid Connection: 21 Dec 1974      Cumulative Load Factor: 87.5%  
 Date of Commercial Operation: 21 Dec 1974      Cumulative Unit Capability Factor: 87.9%  
    Cumulative Energy Unavailability Factor: 12.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	7.4	513	100.0	100.0	100.0	100.0	5.6	5.6	104	41.3
1975	3176.2	520	69.9	70.7	69.9	70.7	69.9	68.1	7035	80.5
1976	2660.6	520	58.2	64.6	58.2	64.6	58.2	63.2	6657	75.8
1977	3882.3	511	86.7	71.8	86.7	71.8	86.7	70.9	7807	89.1
1978	3924.4	507	88.2	75.8	88.2	75.8	88.4	75.2	8126	92.8
1979	4193.0	500	94.6	79.4	94.6	79.4	95.7	79.2	8661	98.9
1980	3468.7	500	81.5	79.8	81.4	79.8	79.0	79.1	7167	81.6
1981	3092.9	500	71.4	78.6	71.4	78.6	70.6	77.9	6292	71.8
1982	3857.7	500	90.0	80.0	89.8	80.0	88.1	79.2	7844	89.5
1983	3716.3	500	86.5	80.7	86.5	80.7	84.8	79.8	7574	86.5
1984	3906.0	500	89.2	81.6	89.2	81.5	88.9	80.7	7830	89.1
1985	3612.5	500	92.9	82.6	92.9	82.6	82.5	80.9	7378	84.2
1986	3854.0	500	90.6	83.2	90.6	83.2	88.0	81.5	7930	90.5
1987	4462.2	500	100.0	84.5	100.0	84.5	101.9	83.0	8760	100.0
1988	3886.2	500	88.2	84.8	88.2	84.8	88.5	83.4	7773	88.5
1989	3887.2	500	96.9	85.6	96.9	85.6	88.7	83.7	7798	89.0
1990	3803.7	500	83.3	85.4	83.3	85.4	86.8	83.9	7602	86.8
1991	4480.4	502	100.0	86.3	100.0	86.3	101.8	85.0	8760	100.0
1992	3223.5	500	73.5	85.6	73.5	85.6	73.4	84.3	6516	74.2
1993	3746.2	503	83.5	85.5	83.5	85.5	85.0	84.4	7338	83.8
1994	4553.0	512	99.7	86.2	99.7	86.2	101.5	85.3	8734	99.7
1995	3968.2	512	87.5	86.3	87.5	86.2	88.5	85.4	7666	87.5
1996	4485.1	512	99.2	86.9	98.6	86.8	99.7	86.1	8653	98.5
1997	3642.9	512	82.0	86.6	82.0	86.6	81.2	85.9	7180	82.0



1998	3333.7	512	74.8	86.1	74.8	86.1	74.3	85.4	6555	74.8
1999	4597.4	522	99.2	86.7	99.2	86.6	100.5	86.0	8690	99.2
2000	4182.3	522	89.0	86.8	89.0	86.7	91.2	86.2	7820	89.0
2001	4271.0	522	91.7	87.0	91.7	86.9	93.4	86.5	8031	91.7
2002	4296.0	522	92.4	87.2	92.4	87.1	93.9	86.7	8082	92.3
2003	4241.0	522	92.0	87.3	92.0	87.3	92.7	87.0	8058	92.0
2004	4660.3	522	99.5	87.7	99.5	87.7	101.6	87.5	8737	99.5
2005	3848.6	522	83.3	87.6	83.3	87.6	84.2	87.4	7296	83.3
2006	4012.4	522	87.5	87.6	87.5	87.6	87.7	87.4	7665	87.5
2007	4456.6	545	96.9	87.9	96.9	87.9	93.3	87.6	8488	96.9
2008	4059.4	545	88.4	87.9	88.4	87.9	84.8	87.5	7768	88.4
2009	4653.3	545	100.0	88.3	100.0	88.3	97.5	87.8	8760	100.0
2010	4128.1	554	89.3	88.3	89.3	88.3	86.1	87.7	7817	89.2
2011	4477.6	519	95.1	88.5	95.1	88.5	98.5	88.0	8354	95.4
2012	3354.8	518	73.5	88.1	73.5	88.1	73.7	87.6	6453	73.5
2013	3069.7	519	72.1	87.7	72.1	87.7	67.5	87.1	6311	72.0
2014	4570.7	518	97.7	87.9	97.7	87.9	100.7	87.5	8556	97.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					196	
C. Inspection, maintenance or repair combined with refuelling	74			660		
D. Inspection, maintenance or repair without refuelling	129			75		
E. Testing of plant systems or components				4		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						12
Z. Other					2	1
Subtotal	203	0	0	739	199	13
Total	203			951		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		36
13. Reactor Auxiliary Systems		3
14. Safety Systems		1
15. Reactor Cooling Systems		41
16. Steam generation systems		5
31. Turbine and auxiliaries		64
32. Feedwater and Main Steam System		3
33. Circulating Water System		2
35. All other I&C Systems		0
41. Main Generator Systems		5
42. Electrical Power Supply Systems		26
XX. Miscellaneous Systems		4
Total	0	190

# US-254 QUAD CITIES-1

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 908.0 MW(e)

Design Net Capacity: 789.0 MW(e)

Design Discharge Burnup: 47000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8168.3 GW(e)·h

Energy Availability Factor: 100.0%

Load Factor: 102.7%

Operating Factor: 100.0%

Energy Unavailability Factor: 0.0%

Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	701.0	632.2	697.6	672.4	693.0	664.9	686.3	682.9	665.5	697.5	671.9	703.0	8168.3
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	103.8	103.6	103.4	102.8	102.6	101.7	101.6	101.1	101.8	103.3	102.6	104.1	102.7
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 15 Feb 1967      Lifetime Generation: 225841.7 GW(e)·h

Date of First Criticality: 18 Oct 1971      Cumulative Energy Availability Factor: 80.0%

Date of Grid Connection: 12 Apr 1972      Cumulative Load Factor: 75.6%

Date of Commercial Operation: 18 Feb 1973      Cumulative Unit Capability Factor: 80.0%

   Cumulative Energy Unavailability Factor: 20.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	4451.0	800	87.0	87.0	87.0	87.0	69.4	69.4	6667	83.2
1974	3464.1	800	61.4	73.6	61.4	73.6	49.4	59.0	5365	61.2
1975	4413.4	800	61.0	69.3	61.0	69.3	63.0	60.3	7531	86.0
1976	3401.7	769	50.4	64.6	50.4	64.6	50.4	57.9	5699	64.9
1977	3527.4	769	52.4	62.2	52.4	62.2	52.4	56.8	6176	70.5
1978	4782.0	769	71.0	63.7	71.0	63.7	71.0	59.1	8315	94.9
1979	4786.5	769	71.1	64.7	71.1	64.7	71.1	60.8	7096	81.0
1980	3468.8	769	67.4	65.1	66.7	65.0	51.4	59.6	5840	66.5
1981	5726.8	769	94.3	68.3	94.3	68.2	85.0	62.4	8244	94.1
1982	3258.0	769	68.5	68.3	68.5	68.2	48.4	61.0	5951	67.9
1983	5776.4	769	94.7	70.7	94.7	70.6	85.7	63.3	8258	94.3
1984	3358.5	769	53.4	69.3	53.4	69.2	49.7	62.2	4687	53.4
1985	6072.3	769	94.1	71.2	94.1	71.1	90.1	64.3	8242	94.1
1986	4426.2	769	68.9	71.0	68.9	70.9	65.7	64.4	6035	68.9
1987	4456.1	769	70.1	70.9	70.1	70.9	66.1	64.5	6141	70.1
1988	5662.0	769	93.4	72.3	93.4	72.3	83.8	65.7	8199	93.3
1989	4280.4	769	73.4	72.4	73.4	72.4	63.5	65.6	6428	73.4
1990	5345.6	769	83.1	73.0	83.1	73.0	79.4	66.4	7276	83.1
1991	3549.5	769	56.6	72.1	55.8	72.1	52.7	65.6	4882	55.7
1992	4166.1	769	70.1	72.0	70.1	72.0	61.7	65.4	6158	70.1
1993	5042.5	769	78.8	72.4	78.8	72.3	74.9	65.9	6902	78.8
1994	1670.2	769	28.9	70.4	28.9	70.3	24.8	64.0	2526	28.8
1995	5886.2	769	90.6	71.3	90.6	71.2	87.4	65.0	7934	90.6
1996	2680.6	769	42.9	70.1	42.9	70.0	39.7	64.0	3769	42.9

1997	5565.5	769	88.7	70.8	88.7	70.8	82.6	64.7	7764	88.6
1998	3142.9	769	49.1	70.0	49.1	69.9	46.7	64.0	4299	49.1
1999	6337.6	769	93.7	70.9	93.7	70.8	94.1	65.1	8210	93.7
2000	6168.1	769	93.8	71.7	93.8	71.6	91.3	66.1	8242	93.8
2001	6710.9	769	99.2	72.6	99.2	72.6	99.6	67.2	8691	99.2
2002	5709.5	855	86.6	73.1	86.6	73.1	84.0	67.8	7564	86.3
2003	6810.2	855	92.4	73.8	92.4	73.7	90.9	68.6	8013	91.5
2004	6502.8	855	100.0	74.7	100.0	74.7	86.6	69.2	8784	100.0
2005	6281.1	864	89.9	75.2	89.9	75.2	83.0	69.7	7875	89.9
2006	6747.3	867	93.2	75.8	93.2	75.8	88.8	70.3	8161	93.2
2007	6951.0	867	93.7	76.4	93.7	76.3	91.5	71.0	8212	93.7
2008	7490.1	867	100.0	77.1	100.0	77.0	98.4	71.8	8784	100.0
2009	6230.8	867	90.0	77.5	90.0	77.4	82.0	72.1	7879	89.9
2010	7646.1	882	99.3	78.1	99.3	78.1	99.0	72.9	8698	99.3
2011	7109.2	882	90.2	78.5	90.2	78.4	92.0	73.5	7898	90.2
2012	8130.4	908	100.0	79.1	100.0	79.0	101.9	74.3	8784	100.0
2013	7506.0	908	92.2	79.4	92.2	79.4	94.4	74.8	8073	92.1
2014	8168.3	908	100.0	80.0	100.0	80.0	102.7	75.6	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					287	
C. Inspection, maintenance or repair combined with refuelling				985		
D. Inspection, maintenance or repair without refuelling				138	67	
E. Testing of plant systems or components				7	6	
H. Nuclear regulatory requirements					7	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						11
L. Human factor related					59	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
P. Fire					7	
Z. Other				0	7	1
Subtotal	0	0	0	1130	440	13
Total	0			1583		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		20
13. Reactor Auxiliary Systems		2
14. Safety Systems		6
15. Reactor Cooling Systems		88
31. Turbine and auxiliaries		72
32. Feedwater and Main Steam System		21
41. Main Generator Systems		14
42. Electrical Power Supply Systems		31
XX. Miscellaneous Systems		23
Total	0	283

## US-265 QUAD CITIES-2

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 911.0 MW(e)

Design Net Capacity: 789.0 MW(e)

Design Discharge Burnup: 47000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 7220.8 GW(e)·h

Energy Availability Factor: 90.0%

Load Factor: 90.5%

Operating Factor: 90.0%

Energy Unavailability Factor: 10.0%

Total Off-line Time: 874 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	697.7	623.3	616.8	0.0	535.5	660.7	681.6	678.2	662.8	694.0	674.5	695.7	7220.8
EAF (%)	100.0	100.0	99.5	0.0	79.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0
UCF (%)	100.0	100.0	99.5	0.0	79.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0
LF (%)	102.9	101.8	91.1	0.0	79.0	100.7	100.6	100.1	101.1	102.4	102.7	102.7	90.5
OF (%)	100.0	100.0	99.5	0.0	79.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0
EUf (%)	0.0	0.0	0.5	100.0	20.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
PUf (%)	0.0	0.0	0.0	80.0	20.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3
UCLF (%)	0.0	0.0	0.5	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 15 Feb 1967      Lifetime Generation: 221201.9 GW(e)·h

Date of First Criticality: 26 Apr 1972      Cumulative Energy Availability Factor: 78.4%

Date of Grid Connection: 23 May 1972      Cumulative Load Factor: 74.2%

Date of Commercial Operation: 10 Mar 1973      Cumulative Unit Capability Factor: 79.1%

   Cumulative Energy Unavailability Factor: 21.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	4392.2	800	86.4	86.4	86.4	86.4	74.8	74.8	6238	84.9
1974	4643.8	800	82.6	84.3	82.6	84.3	66.3	70.1	7232	82.6
1975	2490.9	798	35.7	67.2	35.7	67.2	35.6	58.0	4555	52.0
1976	4320.0	769	64.0	66.4	64.0	66.4	64.0	59.5	7143	81.3
1977	4369.3	769	64.9	66.1	64.9	66.1	64.9	60.6	7118	81.3
1978	4429.1	769	65.7	66.0	65.7	66.0	65.7	61.5	7022	80.2
1979	3993.6	769	59.3	65.1	59.3	65.1	59.3	61.1	7686	87.7
1980	3651.6	769	62.8	64.8	62.5	64.7	54.1	60.3	5486	62.5
1981	3770.7	769	68.1	65.2	68.1	65.1	56.0	59.8	5957	68.0
1982	5062.3	769	84.0	67.0	84.0	67.0	75.1	61.3	7343	83.8
1983	3158.5	769	64.2	66.8	64.2	66.8	46.9	60.0	5620	64.2
1984	4984.4	769	77.9	67.7	77.9	67.7	73.8	61.2	6837	77.8
1985	4560.7	769	71.3	68.0	71.3	68.0	67.7	61.7	6247	71.3
1986	4728.0	769	74.2	68.4	74.2	68.4	70.2	62.3	6399	73.0
1987	4953.0	769	78.1	69.1	78.1	69.1	73.5	63.0	6832	78.0
1988	4178.9	769	70.5	69.2	70.5	69.2	61.9	63.0	6193	70.5
1989	5743.1	769	95.5	70.7	95.5	70.7	85.3	64.3	8363	95.5
1990	4373.6	769	70.4	70.7	70.4	70.7	64.9	64.3	6186	70.6
1991	5285.2	769	88.3	71.6	88.3	71.6	78.5	65.1	7731	88.3
1992	3464.2	769	64.0	71.2	64.0	71.2	51.3	64.4	5621	64.0
1993	3111.8	769	51.8	70.3	51.8	70.3	46.2	63.5	4538	51.8
1994	4013.3	769	65.7	70.1	65.7	70.1	59.6	63.3	5745	65.6
1995	2497.0	769	45.3	69.0	45.3	69.0	37.1	62.2	3966	45.3
1996	4666.8	769	98.8	70.3	72.3	69.2	69.1	62.5	6348	72.3

1997	2627.7	769	42.3	69.2	42.3	68.1	39.0	61.5	3718	42.4
1998	3819.6	769	59.0	68.8	58.2	67.7	56.7	61.3	5095	58.2
1999	6596.7	769	97.5	69.8	97.5	68.8	97.9	62.7	8537	97.5
2000	6220.6	769	92.9	70.7	92.9	69.7	92.1	63.7	8156	92.9
2001	6273.8	769	91.9	71.4	91.9	70.4	93.1	64.8	8058	92.0
2002	6556.8	855	90.4	72.1	90.4	71.2	89.8	65.7	7852	89.6
2003	6975.1	855	94.0	72.9	94.0	72.0	93.1	66.6	8181	93.4
2004	6179.4	855	90.5	73.5	90.5	72.6	82.3	67.2	7955	90.6
2005	7036.9	864	97.4	74.3	97.4	73.4	93.0	68.0	8533	97.4
2006	6611.0	867	91.3	74.8	91.3	74.0	87.0	68.7	8000	91.3
2007	7505.8	867	99.6	75.6	99.6	74.8	98.8	69.6	8720	99.5
2008	6734.6	867	89.4	76.0	89.4	75.3	88.4	70.2	7852	89.4
2009	6909.4	867	100.0	76.7	100.0	76.0	91.0	70.8	8760	100.0
2010	7150.1	892	89.9	77.1	89.9	76.4	91.5	71.4	7849	89.6
2011	8092.3	892	99.8	77.8	99.8	77.1	103.6	72.4	8743	99.8
2012	7375.6	911	91.1	78.2	91.1	77.5	92.2	72.9	8004	91.1
2013	8051.8	911	99.6	78.8	99.6	78.1	100.9	73.7	8723	99.6
2014	7220.8	911	90.0	79.1	90.0	78.4	90.5	74.2	7886	90.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		41			439	
C. Inspection, maintenance or repair combined with refuelling	725			938		
D. Inspection, maintenance or repair without refuelling				123		
E. Testing of plant systems or components				3	0	
H. Nuclear regulatory requirements					9	
K. Load-following (frequency control, reserve shutdown due to reduced energy demand, reactive power)						13
L. Human factor related					12	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
P. Fire		106			4	
Z. Other				81	38	54
Subtotal	725	147	0	1145	502	68
Total		872			1715	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		23
12. Reactor I&C Systems	41	12
13. Reactor Auxiliary Systems		3
14. Safety Systems		15
15. Reactor Cooling Systems		62
16. Steam generation systems		10
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries		77
32. Feedwater and Main Steam System		44
33. Circulating Water System		6
35. All other I&C Systems		1
41. Main Generator Systems		30
42. Electrical Power Supply Systems		62
XX. Miscellaneous Systems		81
Total	41	432

# US-458 RIVER BEND-1

Operator: ENTERGY (Entergy Nuclear Operations, Inc.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 967.0 MW(e)

Design Net Capacity: 966.0 MW(e)

Design Discharge Burnup: 29600 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8197.5 GW(e)·h

Energy Availability Factor: 97.3%

Load Factor: 96.8%

Operating Factor: 97.3%

Energy Unavailability Factor: 2.7%

Total Off-line Time: 235 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	730.3	659.5	729.5	698.8	725.1	698.8	715.8	710.9	685.8	505.9	709.8	627.3	8197.5
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.1	100.0	91.2	97.3
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.1	100.0	91.2	97.3
LF (%)	101.5	101.5	101.5	100.4	100.8	100.4	99.5	98.8	98.5	70.3	101.8	87.2	96.8
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.2	100.0	91.3	97.3
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.9	0.0	8.8	2.7
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.9	0.0	8.8	2.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 25 Mar 1977      Lifetime Generation: 195438.1 GW(e)·h

Date of First Criticality: 31 Oct 1985      Cumulative Energy Availability Factor: 84.1%

Date of Grid Connection: 03 Dec 1985      Cumulative Load Factor: 81.7%

Date of Commercial Operation: 16 Jun 1986      Cumulative Unit Capability Factor: 84.3%

   Cumulative Energy Unavailability Factor: 15.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1986	2310.4	936	54.1	54.1	54.1	54.1	48.0	48.0	2763	53.8
1987	4964.4	936	66.7	62.0	66.7	62.0	60.5	55.9	5836	66.6
1988	7249.0	936	92.8	73.9	92.8	73.9	88.2	68.4	8149	92.8
1989	4785.0	936	66.9	72.0	66.9	72.0	58.4	65.6	5853	66.8
1990	5592.6	936	75.8	72.8	75.8	72.8	68.2	66.2	6642	75.8
1991	6687.2	936	85.7	75.1	85.7	75.1	81.6	68.9	7507	85.7
1992	2762.7	936	36.5	69.3	36.5	69.3	33.6	63.6	3210	36.5
1993	5257.9	936	69.4	69.3	69.4	69.3	64.1	63.6	6076	69.4
1994	4886.2	936	62.3	68.5	62.3	68.5	59.6	63.2	5455	62.3
1995	7930.8	936	99.4	71.7	99.4	71.7	96.7	66.7	8704	99.4
1996	6860.3	936	84.2	72.9	84.2	72.9	83.4	68.2	7391	84.1
1997	6822.7	936	84.8	73.9	84.8	73.9	83.2	69.5	7427	84.8
1998	7833.5	936	95.9	75.7	95.9	75.7	95.5	71.6	8404	95.9
1999	5704.8	936	74.0	75.5	74.0	75.5	69.6	71.5	6476	73.9
2000	7352.7	936	88.8	76.4	88.8	76.4	89.4	72.7	7795	88.7
2001	7811.8	936	92.4	77.5	92.4	77.5	95.3	74.1	8120	92.7
2002	8472.4	966	97.9	78.7	97.9	78.7	100.1	75.7	8579	97.9
2003	7653.2	966	91.8	79.5	91.8	79.5	90.4	76.6	8050	91.9
2004	7427.4	966	88.2	80.0	88.2	80.0	87.5	77.2	7758	88.3
2005	7822.5	978	93.2	80.7	93.2	80.7	91.3	78.0	8162	93.2
2006	7478.3	966	90.4	81.2	90.4	81.2	88.4	78.5	7921	90.4
2007	7184.6	970	90.5	81.6	90.5	81.6	84.6	78.8	7916	90.4
2008	6366.6	970	83.0	81.7	77.1	81.4	74.7	78.6	6771	77.1
2009	7833.4	978	92.4	82.1	92.4	81.9	91.4	79.1	8085	92.3

2010	8363.2	974	98.7	82.8	98.7	82.6	98.0	79.9	8642	98.7
2011	7696.4	967	91.2	83.2	91.2	82.9	90.9	80.4	7988	91.2
2012	7819.9	967	93.1	83.5	93.1	83.3	92.1	80.8	8172	93.0
2013	7599.8	967	90.2	83.8	90.2	83.6	89.7	81.1	7898	90.1
2014	8197.5	967	97.3	84.3	97.3	84.1	96.8	81.7	8525	97.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		235			341	
C. Inspection, maintenance or repair combined with refuelling				746		
D. Inspection, maintenance or repair without refuelling				161		
E. Testing of plant systems or components				10	18	
L. Human factor related					20	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						17
P. Fire					0	
Z. Other				9	102	
Subtotal	0	235	0	926	481	17
Total		235			1424	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	65	61
13. Reactor Auxiliary Systems		2
14. Safety Systems		8
15. Reactor Cooling Systems		83
17. Safety I&C Systems (excluding reactor I&C)		9
31. Turbine and auxiliaries	170	43
32. Feedwater and Main Steam System		51
33. Circulating Water System		2
35. All other I&C Systems		8
41. Main Generator Systems		20
42. Electrical Power Supply Systems		32
XX. Miscellaneous Systems		14
Total	235	333

## US-261 ROBINSON-2

Operator: PROGRESS (Progress Energy)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 741.0 MW(e)

Design Net Capacity: 700.0 MW(e)

Design Discharge Burnup: 30000 MW·d/t

Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 6159.4 GW(e)·h

Energy Availability Factor: 91.0%

Load Factor: 94.9%

Operating Factor: 91.0%

Energy Unavailability Factor: 9.0%

Total Off-line Time: 785 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	542.2	537.6	130.0	422.0	575.0	544.8	561.4	562.0	548.4	575.7	566.1	594.2	6159.4
EAF (%)	92.9	100.0	23.0	77.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.0
UCF (%)	92.9	100.0	23.0	77.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.0
LF (%)	98.3	108.0	23.6	79.1	104.3	102.1	101.8	101.9	102.8	104.4	106.0	107.8	94.9
OF (%)	92.9	100.0	23.1	77.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.0
EUf (%)	7.1	0.0	77.0	22.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
PUf (%)	0.0	0.0	77.0	22.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.4
UCLF (%)	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 13 Apr 1967      Lifetime Generation: 205673.7 GW(e)·h

Date of First Criticality: 20 Sep 1970      Cumulative Energy Availability Factor: 79.5%

Date of Grid Connection: 26 Sep 1970      Cumulative Load Factor: 77.5%

Date of Commercial Operation: 07 Mar 1971      Cumulative Unit Capability Factor: 79.7%

   Cumulative Energy Unavailability Factor: 20.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1971	2337.3	739	100.0	100.0	100.0	100.0	43.1	43.1	3534	48.1
1972	5082.4	739	100.0	100.0	100.0	100.0	78.3	62.3	7487	85.2
1973	3765.5	715	75.7	91.6	75.7	91.6	60.1	61.5	6591	75.2
1974	4813.1	700	83.3	89.5	83.3	89.5	78.5	65.8	7297	83.3
1975	4170.9	665	71.0	86.0	71.0	86.0	71.6	66.9	6316	72.1
1976	4874.2	667	82.5	85.4	82.5	85.4	83.2	69.6	7435	84.6
1977	4130.2	665	70.8	83.4	70.8	83.4	70.9	69.8	7462	85.2
1978	3980.0	665	68.2	81.5	68.2	81.5	68.3	69.6	6307	72.0
1979	4005.1	665	68.7	80.1	68.7	80.1	68.8	69.5	6172	70.5
1980	3210.9	665	61.9	78.3	61.9	78.3	55.0	68.1	5464	62.2
1981	3510.8	665	81.1	78.6	73.4	77.9	60.3	67.4	6391	73.0
1982	2268.4	665	47.9	76.0	47.9	75.4	38.9	65.0	4278	48.8
1983	3347.5	665	75.5	76.0	75.5	75.4	57.5	64.5	6609	75.4
1984	224.3	665	7.0	71.1	7.0	70.6	3.8	60.2	615	7.0
1985	5239.9	665	87.6	72.2	87.6	71.7	89.9	62.1	7697	87.9
1986	4799.6	665	79.7	72.7	79.7	72.2	82.4	63.4	7028	80.2
1987	4235.5	665	70.3	72.5	70.3	72.1	72.7	63.9	6224	71.1
1988	3182.4	665	64.2	72.1	64.2	71.7	54.5	63.4	5717	65.1
1989	2790.5	665	45.5	70.7	45.5	70.3	47.9	62.6	4107	46.9
1990	3319.2	665	63.1	70.3	63.1	69.9	57.0	62.3	5614	64.1
1991	4792.2	672	80.2	70.8	80.2	70.4	81.3	63.2	7048	80.5
1992	4062.9	683	66.2	70.6	66.2	70.2	67.7	63.4	5812	66.2
1993	4193.3	683	70.1	70.6	70.1	70.2	70.1	63.7	6137	70.1
1994	4655.1	683	78.2	70.9	78.2	70.6	77.8	64.3	6845	78.1



1995	5033.8	683	84.0	71.4	84.0	71.1	84.1	65.1	7356	84.0
1996	5460.1	683	88.2	72.1	88.2	71.8	91.0	66.1	7745	88.2
1997	6197.6	683	98.9	73.1	98.9	72.8	103.6	67.5	8662	98.9
1998	5505.6	683	88.5	73.6	88.5	73.4	92.0	68.4	7751	88.5
1999	5684.5	683	91.4	74.3	91.4	74.0	95.0	69.4	8009	91.4
2000	6237.1	683	99.6	75.1	99.6	74.9	104.0	70.5	8750	99.6
2001	5515.0	683	90.4	75.6	90.4	75.4	92.2	71.2	7919	90.4
2002	5606.1	683	90.9	76.1	90.9	75.9	93.7	71.9	7960	90.9
2003	6439.9	710	100.0	76.9	100.0	76.6	103.5	72.9	8760	100.0
2004	5742.2	710	88.9	77.2	88.9	77.0	92.1	73.5	7811	88.9
2005	5770.1	710	89.5	77.6	89.5	77.4	92.8	74.1	7839	89.5
2006	6442.7	710	99.4	78.2	99.4	78.0	103.6	75.0	8705	99.4
2007	5737.9	710	89.3	78.5	89.3	78.3	92.3	75.5	7825	89.3
2008	5429.3	710	84.0	78.7	84.0	78.5	87.1	75.8	7380	84.0
2009	6473.2	710	98.9	79.2	98.9	79.0	104.1	76.5	8667	98.9
2010	3598.4	724	56.8	78.6	56.8	78.5	56.7	76.0	4902	56.0
2011	6363.8	724	99.1	79.2	99.1	79.0	100.3	76.6	8677	99.1
2012	5388.1	741	81.9	79.2	81.9	79.1	83.3	76.8	7165	81.6
2013	5696.5	741	85.0	79.4	85.0	79.2	87.7	77.1	7446	85.0
2014	6159.4	741	91.0	79.7	91.0	79.5	94.9	77.5	7975	91.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1971 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		52			487	
C. Inspection, maintenance or repair combined with refuelling				1135		
D. Inspection, maintenance or repair without refuelling	733			36		
E. Testing of plant systems or components				0	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirements					107	
L. Human factor related					51	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Z. Other					31	
Subtotal	733	52	0	1172	676	0
Total	785			1848		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1971 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		34
13. Reactor Auxiliary Systems		2
14. Safety Systems		31
15. Reactor Cooling Systems		77
16. Steam generation systems		103
31. Turbine and auxiliaries	52	88
32. Feedwater and Main Steam System		33
35. All other I&C Systems		0
41. Main Generator Systems		0
42. Electrical Power Supply Systems		99
XX. Miscellaneous Systems		15
Total	52	482

**Operator:** PSEG (PSEG Nuclear LLC)  
**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type:	PWR
Net Reference Unit Power (RUP at the beginning of 2014:	1168.0 MW(e)
Design Net Capacity:	1090.0 MW(e)
Design Discharge Burnup:	40000 MW·d/t
Status at end of year:	Operational

## 2. Production Summary 2014

<b>Net Energy Production:</b>	8891.5 GW(e)-h
<b>Energy Availability Factor:</b>	87.4%
<b>Load Factor:</b>	86.9%
<b>Operating Factor:</b>	87.4%
<b>Energy Unavailability Factor:</b>	12.6%
<b>Total Off-line Time:</b>	1103 hours

### 3. 2014 Monthly Performance Data

[illegible]

**UCLF replaces previously used UUF.**

#### 4. 2014 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	25 Sep 1968	<b>Lifetime Generation:</b>	252105.1 GW(e)-h
<b>Date of First Criticality:</b>	11 Dec 1976	<b>Cumulative Energy Availability Factor:</b>	71.0%
<b>Date of Grid Connection:</b>	25 Dec 1976	<b>Cumulative Load Factor:</b>	68.3%
<b>Date of Commercial Operation:</b>	30 Jun 1977	<b>Cumulative Unit Capability Factor:</b>	71.2%
		<b>Cumulative Energy Unavailability Factor:</b>	29.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1977	2058.8	1079	50.8	50.8	50.8	50.8	37.2	37.2	2432	47.4
1978	4537.0	1079	48.0	49.0	48.0	49.0	48.0	44.0	4862	55.5
1979	2084.3	1079	22.0	38.6	22.0	38.6	22.1	35.5	2231	25.5
1980	5689.8	1079	74.2	48.6	69.5	47.2	60.0	42.4	6075	69.2
1981	6191.3	1079	78.5	55.1	78.5	54.0	65.5	47.4	6839	78.1
1982	4107.4	1079	47.0	53.6	47.0	52.8	43.5	46.7	4192	47.9
1983	5408.8	1079	57.6	54.2	57.6	53.5	57.2	48.3	5127	58.5
1984	2160.1	1079	27.1	50.6	27.1	50.0	22.8	44.9	2378	27.1
1985	9007.5	1079	95.2	55.8	95.2	55.3	95.3	50.8	8345	95.3
1986	7084.0	1083	78.6	58.2	78.6	57.7	74.6	53.3	6921	79.0
1987	6216.6	1106	73.1	59.6	72.6	59.2	64.2	54.3	6362	72.6
1988	7418.6	1106	77.9	61.3	77.9	60.8	76.4	56.3	6841	77.9
1989	6213.3	1106	69.2	61.9	69.2	61.5	64.1	56.9	6059	69.2
1990	5999.2	1106	67.0	62.3	67.0	61.9	61.9	57.3	5868	67.0
1991	6810.3	1106	74.0	63.1	74.0	62.7	70.3	58.2	6479	74.0
1992	5307.8	1106	58.0	62.8	58.0	62.4	54.6	58.0	5090	57.9
1993	5870.6	1106	65.6	62.9	65.6	62.6	60.6	58.1	5746	65.6
1994	5779.3	1106	67.0	63.2	67.0	62.9	59.7	58.2	5865	67.0
1995	2554.4	1106	30.1	61.4	30.1	61.1	26.4	56.5	2632	30.0
1996	0.0	1106	0.0	58.2	0.0	57.9	0.0	53.6	0	0.0
1997	0.0	1106	0.0	55.3	0.0	55.1	0.0	50.9	0	0.0
1998	6475.6	1106	70.8	56.1	70.8	55.8	66.8	51.7	6199	70.8
1999	8009.2	1106	87.5	57.5	87.5	57.2	82.7	53.1	7663	87.5
2000	8952.6	1106	94.8	59.1	94.8	58.8	92.2	54.7	8328	94.8

2001	7709.4	1096	80.9	59.9	80.9	59.7	80.8	55.8	7116	81.2
2002	8620.6	1096	89.5	61.1	89.5	60.9	89.8	57.1	7855	89.7
2003	9096.7	1096	95.8	62.4	95.8	62.2	94.7	58.5	8401	95.9
2004	7452.7	1159	77.6	63.0	77.6	62.8	75.2	59.2	6766	77.0
2005	9440.6	1111	92.5	64.0	92.5	63.8	97.0	60.5	8105	92.5
2006	10228.1	1174	99.6	65.3	99.6	65.1	99.5	61.9	8725	99.6
2007	9158.5	1174	91.5	66.2	91.5	66.1	89.1	62.8	8013	91.5
2008	9333.8	1174	91.7	67.1	91.7	66.9	90.5	63.8	8053	91.7
2009	10221.8	1174	99.7	68.1	99.7	68.0	99.4	64.9	8735	99.7
2010	8776.6	1174	87.4	68.7	87.4	68.6	85.3	65.6	7653	87.4
2011	8835.8	1174	91.3	69.4	89.6	69.2	85.9	66.2	7847	89.6
2012	9896.8	1168	96.5	70.2	96.5	70.0	96.5	67.1	8472	96.4
2013	9124.2	1168	87.8	70.7	87.8	70.6	89.2	67.7	7692	87.8
2014	8891.5	1168	87.4	71.2	87.4	71.0	86.9	68.3	7657	87.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1977 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		278			1186	
C. Inspection, maintenance or repair combined with refuelling	825			940		
D. Inspection, maintenance or repair without refuelling				85		
E. Testing of plant systems or components				1	1	
H. Nuclear regulatory requirements					128	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					8	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						8
Z. Other				11	92	
Subtotal	825	278	0	1037	1415	9
Total		1103			2461	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1977 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		70
13. Reactor Auxiliary Systems		5
14. Safety Systems		15
15. Reactor Cooling Systems		76
16. Steam generation systems		433
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		210
32. Feedwater and Main Steam System	69	100
33. Circulating Water System		53
35. All other I&C Systems		5
41. Main Generator Systems	208	93
42. Electrical Power Supply Systems		40
XX. Miscellaneous Systems		76
Total	277	1180

**US-311 SALEM-2****Operator:** PSEG (PSEG Nuclear LLC)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1158.0 MW(e)

**Design Net Capacity:** 1115.0 MW(e)

**Design Discharge Burnup:** 40000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 7490.5 GW(e)·h

**Energy Availability Factor:** 74.1%

**Load Factor:** 73.8%

**Operating Factor:** 74.1%

**Energy Unavailability Factor:** 25.9%

**Total Off-line Time:** 2272 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	862.6	710.9	878.8	331.6	0.0	0.0	429.2	858.9	832.7	861.5	845.0	879.4	7490.5
<b>EAF (%)</b>	98.1	94.9	100.0	39.4	0.0	0.0	56.4	100.0	100.0	100.0	100.0	100.0	74.1
<b>UCF (%)</b>	98.1	94.9	100.0	39.4	0.0	0.0	56.4	100.0	100.0	100.0	100.0	100.0	74.1
<b>LF (%)</b>	100.1	91.4	102.1	39.8	0.0	0.0	49.8	99.7	99.9	100.0	101.2	102.1	73.8
<b>OF (%)</b>	98.1	94.9	100.0	39.4	0.0	0.0	56.5	100.0	100.0	100.0	100.0	100.0	74.1
<b>EUf (%)</b>	1.9	5.1	0.0	60.6	100.0	100.0	43.6	0.0	0.0	0.0	0.0	0.0	25.9
<b>PUf (%)</b>	0.0	0.0	0.0	60.6	100.0	100.0	43.6	0.0	0.0	0.0	0.0	0.0	25.4
<b>UCLF (%)</b>	1.9	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 25 Sep 1968      **Lifetime Generation:** 228888.5 GW(e)·h

**Date of First Criticality:** 08 Aug 1980      **Cumulative Energy Availability Factor:** 73.3%

**Date of Grid Connection:** 03 Jun 1981      **Cumulative Load Factor:** 69.9%

**Date of Commercial Operation:** 13 Oct 1981      **Cumulative Unit Capability Factor:** 73.3%

**Cumulative Energy Unavailability Factor:** 26.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	1632.1	1105	96.3	96.3	96.3	96.3	76.9	76.9	1817	94.6
1982	7941.7	1106	97.5	97.3	97.5	97.3	82.0	81.1	8517	97.2
1983	775.2	1106	12.6	59.2	12.6	59.2	8.0	48.1	1078	12.3
1984	3225.7	1106	36.4	52.1	36.4	52.1	33.2	43.5	3192	36.3
1985	5033.8	1106	56.2	53.1	56.2	53.1	52.0	45.5	4923	56.2
1986	5317.7	1106	61.6	54.7	61.6	54.7	54.9	47.3	5388	61.5
1987	6176.6	1106	72.4	57.5	72.4	57.5	63.8	49.9	6338	72.4
1988	5982.2	1106	66.5	58.8	66.5	58.8	61.6	51.6	5838	66.5
1989	7824.6	1106	84.7	61.9	84.7	61.9	80.8	55.1	7419	84.7
1990	5446.1	1106	72.2	63.0	72.2	63.0	56.2	55.2	5163	58.9
1991	7662.3	1106	82.1	64.9	82.1	64.9	79.1	57.6	7188	82.1
1992	4744.6	1106	53.1	63.8	53.1	63.8	48.8	56.8	4657	53.0
1993	5575.5	1106	60.9	63.6	60.9	63.6	57.5	56.8	5328	60.8
1994	5606.8	1106	69.4	64.0	69.4	64.0	57.9	56.9	6076	69.4
1995	2071.7	1106	25.8	61.4	25.8	61.4	21.4	54.4	2261	25.8
1996	0.0	1106	0.0	57.3	0.0	57.3	0.0	50.8	0	0.0
1997	2564.3	1106	32.4	55.8	32.4	55.8	26.5	49.3	2834	32.4
1998	7797.2	1106	83.2	57.4	83.2	57.4	80.5	51.1	7287	83.2
1999	7949.4	1106	84.8	58.9	84.8	58.9	82.0	52.8	7431	84.8
2000	8381.7	1106	89.0	60.4	89.0	60.4	86.3	54.6	7819	89.0
2001	9517.6	1092	99.7	62.4	99.7	62.4	100.0	56.8	8736	99.7
2002	8367.4	1092	86.8	63.5	86.8	63.5	87.5	58.2	7620	87.0
2003	8095.6	1116	83.7	64.4	83.7	64.4	84.5	59.4	7355	84.0
2004	8799.8	1116	90.3	65.5	90.3	65.5	89.8	60.7	7945	90.4

2005	8886.0	1129	90.1	66.6	90.1	66.6	89.8	61.9	7897	90.1
2006	9147.4	1130	93.9	67.7	93.9	67.7	92.4	63.2	8220	93.8
2007	9669.4	1130	97.1	68.8	97.1	68.8	97.7	64.5	8506	97.1
2008	8222.0	1156	82.8	69.3	82.8	69.3	81.6	65.2	7285	82.9
2009	9427.5	1158	92.1	70.2	92.1	70.2	92.9	66.2	8069	92.1
2010	9954.8	1158	98.4	71.2	98.4	71.2	98.1	67.3	8620	98.4
2011	9162.8	1158	89.8	71.8	89.8	71.8	90.3	68.1	7863	89.8
2012	8758.6	1158	89.2	72.4	89.2	72.4	86.1	68.7	7813	88.9
2013	10262.8	1158	100.0	73.3	100.0	73.3	101.2	69.8	8760	100.0
2014	7490.5	1158	74.1	73.3	74.1	73.3	73.8	69.9	6488	74.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		48			952	
C. Inspection, maintenance or repair combined with refuelling	2224			874		
D. Inspection, maintenance or repair without refuelling				92		
E. Testing of plant systems or components				0	0	
H. Nuclear regulatory requirements					252	
L. Human factor related					7	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
Z. Other				3	22	
Subtotal	2224	48	0	969	1233	4
Total		2272			2206	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems	48	39
13. Reactor Auxiliary Systems		4
14. Safety Systems		44
15. Reactor Cooling Systems		68
16. Steam generation systems		172
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		91
32. Feedwater and Main Steam System		111
33. Circulating Water System		7
35. All other I&C Systems		3
41. Main Generator Systems		234
42. Electrical Power Supply Systems		161
XX. Miscellaneous Systems		10
Total	48	945

# US-443 SEABROOK-1

Operator: NEXTERA (NextEra Energy Resources, LLC)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1246.0 MW(e)  
 Design Net Capacity: 1149.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 10167.6 GW(e)·h  
 Energy Availability Factor: 93.5%  
 Load Factor: 93.2%  
 Operating Factor: 93.5%  
 Energy Unavailability Factor: 6.5%  
 Total Off-line Time: 570 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	927.7	838.3	924.1	145.9	928.3	898.1	928.3	926.3	896.8	927.1	898.7	928.0	10167.6
EAF (%)	100.0	100.0	100.0	20.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.5
UCF (%)	100.0	100.0	100.0	20.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.5
LF (%)	100.1	100.1	99.8	16.3	100.1	100.1	100.1	99.9	100.0	100.0	100.0	100.1	93.2
OF (%)	100.0	100.0	100.0	20.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.5
EUUF (%)	0.0	0.0	0.0	79.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5
PUF (%)	0.0	0.0	0.0	79.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 07 Jul 1976      Lifetime Generation: 218967.8 GW(e)·h  
 Date of First Criticality: 13 Jun 1989      Cumulative Energy Availability Factor: 87.6%  
 Date of Grid Connection: 29 May 1990      Cumulative Load Factor: 85.9%  
 Date of Commercial Operation: 19 Aug 1990      Cumulative Unit Capability Factor: 87.7%  
    Cumulative Energy Unavailability Factor: 12.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1990	3443.5	1151	85.2	85.2	85.2	85.2	81.5	81.5	3131	85.2
1991	6814.4	1150	73.0	76.6	73.0	76.6	67.6	71.7	6394	73.0
1992	7868.4	1150	80.3	78.1	80.3	78.1	77.9	74.3	7056	80.3
1993	9046.8	1150	92.4	82.3	92.4	82.3	89.8	78.8	8094	92.4
1994	6203.5	1150	62.3	77.8	62.3	77.8	61.6	74.9	5466	62.4
1995	8380.6	1150	85.2	79.1	85.2	79.1	83.1	76.4	7465	85.2
1996	9844.2	1158	99.0	82.2	99.0	82.2	96.8	79.6	8690	98.9
1997	7945.7	1158	79.2	81.8	79.2	81.8	78.3	79.5	6929	79.1
1998	8388.4	1158	83.3	82.0	83.3	82.0	82.7	79.8	7294	83.3
1999	8685.7	1156	86.3	82.5	86.3	82.5	85.8	80.5	7564	86.3
2000	7921.5	1155	78.7	82.1	78.7	82.1	78.1	80.2	6910	78.7
2001	8692.2	1155	90.6	82.8	87.9	82.6	85.9	80.7	7703	87.9
2002	9293.4	1155	92.2	83.6	92.2	83.4	91.9	81.6	8083	92.3
2003	9275.4	1155	92.7	84.3	92.7	84.1	91.7	82.4	8121	92.7
2004	10177.0	1155	100.0	85.4	100.0	85.2	100.3	83.6	8784	100.0
2005	9455.2	1159	90.5	85.7	90.5	85.5	93.1	84.2	7928	90.5
2006	9397.4	1224	87.9	85.9	87.9	85.7	87.6	84.5	7718	88.1
2007	10763.9	1245	99.0	86.7	99.0	86.5	98.7	85.3	8669	99.0
2008	9349.6	1245	86.5	86.6	86.5	86.5	85.5	85.3	7596	86.5
2009	8816.7	1245	83.6	86.5	83.6	86.3	80.8	85.1	7326	83.6
2010	10910.1	1247	100.0	87.2	100.0	87.1	99.9	85.9	8760	100.0
2011	8361.7	1247	79.5	86.8	79.5	86.7	76.5	85.4	6959	79.4
2012	8188.9	1246	87.6	86.8	87.6	86.7	74.8	84.9	7689	87.5
2013	10926.1	1246	100.0	87.4	100.0	87.3	100.1	85.6	8760	100.0

2014	10167.6	1246	93.5	87.7	93.5	87.6	93.2	85.9	8190	93.5
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## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1990 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					256	
C. Inspection, maintenance or repair combined with refuelling	570			766		
D. Inspection, maintenance or repair without refuelling				27		
E. Testing of plant systems or components				1	4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						9
Z. Other				0	2	
Subtotal	570	0	0	794	262	9
Total	570			1065		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1990 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
13. Reactor Auxiliary Systems		69
15. Reactor Cooling Systems		34
16. Steam generation systems		0
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		36
35. All other I&C Systems		15
41. Main Generator Systems		36
42. Electrical Power Supply Systems		31
Total	0	252

**US-327 SEQUOYAH-1****Operator:** TVA (Tennessee Valley Authority)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1152.0 MW(e)

**Design Net Capacity:** 1148.0 MW(e)

**Design Discharge Burnup:** 45000 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 10051.8 GW(e)·h

**Energy Availability Factor:** 100.0%

**Load Factor:** 99.6%

**Operating Factor:** 100.0%

**Energy Unavailability Factor:** 0.0%

**Total Off-line Time:** 0 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	863.3	779.5	861.4	829.3	854.1	818.2	839.4	836.7	813.0	853.5	837.6	865.8	10051.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>LF (%)</b>	100.7	100.7	100.6	100.0	99.7	98.6	97.9	97.6	98.0	99.6	100.8	101.0	99.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 27 May 1970      **Lifetime Generation:** 247227.7 GW(e)·h

**Date of First Criticality:** 05 Jul 1980      **Cumulative Energy Availability Factor:** 75.0%

**Date of Grid Connection:** 22 Jul 1980      **Cumulative Load Factor:** 73.2%

**Date of Commercial Operation:** 01 Jul 1981      **Cumulative Unit Capability Factor:** 75.0%

**Cumulative Energy Unavailability Factor:** 25.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1981	2526.9	1128	62.1	62.1	62.1	62.1	50.7	50.7	2688	60.9
1982	4909.7	1128	53.4	56.3	53.4	56.3	49.7	50.0	4626	52.8
1983	7340.9	1139	78.2	65.1	78.2	65.1	73.6	59.5	6791	77.5
1984	6104.7	1148	69.1	66.3	69.1	66.3	60.5	59.8	5992	68.2
1985	4076.1	1148	44.7	61.4	44.7	61.4	40.5	55.5	3760	42.9
1986	0.0	1148	0.0	50.2	0.0	50.2	0.0	45.3	0	0.0
1987	0.0	1148	0.0	42.4	0.0	42.4	0.0	38.3	0	0.0
1988	127.7	1148	6.3	37.6	6.3	37.6	1.3	33.4	282	3.2
1989	9550.6	1148	98.5	44.8	98.5	44.8	95.0	40.6	8624	98.4
1990	6840.7	1148	74.0	47.9	74.0	47.9	68.0	43.5	6406	73.1
1991	7270.1	1122	77.6	50.7	77.6	50.7	74.0	46.4	6774	77.3
1992	8402.5	1122	88.2	53.9	88.2	53.9	85.3	49.7	7734	88.0
1993	1290.5	1122	14.8	50.8	14.8	50.8	13.1	46.8	1219	13.9
1994	6111.6	1111	66.0	51.9	66.0	51.9	62.8	48.0	5774	65.9
1995	6829.5	1111	75.6	53.5	75.6	53.5	70.2	49.5	6620	75.6
1996	9293.5	1112	95.1	56.1	95.1	56.1	95.1	52.4	8344	95.0
1997	8324.3	1117	85.5	57.9	85.5	57.9	85.1	54.3	7486	85.5
1998	8905.7	1118	91.0	59.8	91.0	59.8	90.9	56.4	7966	90.9
1999	9987.0	1122	100.0	61.9	100.0	61.9	101.6	58.8	8760	100.0
2000	7720.5	1122	79.5	62.8	79.5	62.8	78.3	59.8	6988	79.6
2001	9019.0	1122	91.2	64.2	91.2	64.2	91.8	61.4	7988	91.2
2002	9953.5	1125	100.0	65.8	100.0	65.8	101.1	63.2	8760	100.0
2003	7351.1	1125	73.6	66.2	73.6	66.2	74.6	63.7	6443	73.6
2004	9290.5	1148	91.4	67.3	91.4	67.3	92.1	64.9	8027	91.4



2005	10076.5	1150	98.8	68.6	98.8	68.6	100.0	66.4	8658	98.8
2006	9086.0	1150	90.4	69.4	90.4	69.4	90.2	67.3	7915	90.4
2007	8758.3	1148	87.5	70.1	87.5	70.1	87.1	68.1	7668	87.5
2008	10164.8	1148	99.5	71.2	99.5	71.2	100.8	69.3	8738	99.5
2009	8962.2	1148	89.3	71.9	89.3	71.9	89.1	70.0	7820	89.3
2010	8464.1	1152	86.0	72.3	86.0	72.3	83.9	70.5	7524	85.9
2011	9888.5	1152	98.6	73.2	98.6	73.2	98.0	71.4	8636	98.6
2012	8945.2	1152	90.0	73.8	90.0	73.8	88.4	71.9	7907	90.0
2013	8805.6	1152	89.4	74.3	89.4	74.3	87.2	72.4	7834	89.4
2014	10051.8	1152	100.0	75.0	100.0	75.0	99.6	73.2	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1981 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					529	
C. Inspection, maintenance or repair combined with refuelling				790		
D. Inspection, maintenance or repair without refuelling				42		
E. Testing of plant systems or components				0		
H. Nuclear regulatory requirements					268	
L. Human factor related					20	
P. Fire					3	
Z. Other				40	479	
Subtotal	0	0	0	872	1299	0
Total	0			2171		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1981 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		17
13. Reactor Auxiliary Systems		13
14. Safety Systems		33
15. Reactor Cooling Systems		49
16. Steam generation systems		6
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System		256
35. All other I&C Systems		5
41. Main Generator Systems		77
42. Electrical Power Supply Systems		30
XX. Miscellaneous Systems		1
Total	0	526

## US-328 SEQUOYAH-2

Operator: TVA (Tennessee Valley Authority)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1125.0 MW(e)  
 Design Net Capacity: 1148.0 MW(e)  
 Design Discharge Burnup: 45000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 8840.6 GW(e)·h  
 Energy Availability Factor: 89.8%  
 Load Factor: 89.7%  
 Operating Factor: 89.8%  
 Energy Unavailability Factor: 10.2%  
 Total Off-line Time: 893 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	860.7	777.8	857.6	767.5	229.2	315.7	840.9	836.9	812.5	850.8	831.0	860.1	8840.6
EAF (%)	100.0	100.0	100.0	100.0	35.5	42.7	100.0	100.0	100.0	100.0	100.0	100.0	89.8
UCF (%)	100.0	100.0	100.0	100.0	35.5	42.7	100.0	100.0	100.0	100.0	100.0	100.0	89.8
LF (%)	102.8	102.9	102.6	94.7	27.4	39.0	100.5	100.0	100.3	101.7	102.5	102.8	89.7
OF (%)	100.0	100.0	100.0	100.0	35.5	42.6	100.0	100.0	100.0	100.0	100.0	100.0	89.8
EUf (%)	0.0	0.0	0.0	0.0	64.5	57.3	0.0	0.0	0.0	0.0	0.0	0.0	10.2
PUf (%)	0.0	0.0	0.0	0.0	64.5	57.3	0.0	0.0	0.0	0.0	0.0	0.0	10.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 27 May 1970      Lifetime Generation: 244746.4 GW(e)·h  
 Date of First Criticality: 05 Nov 1981      Cumulative Energy Availability Factor: 78.0%  
 Date of Grid Connection: 23 Dec 1981      Cumulative Load Factor: 75.6%  
 Date of Commercial Operation: 01 Jun 1982      Cumulative Unit Capability Factor: 78.0%  
    Cumulative Energy Unavailability Factor: 22.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1982	3926.3	1145	75.0	75.0	75.0	75.0	66.8	66.8	3804	74.1
1983	6691.4	1133	72.8	73.6	72.8	73.6	67.4	67.2	6346	72.4
1984	6403.3	1148	69.8	72.1	69.8	72.1	63.5	65.7	6112	69.6
1985	5625.0	1148	59.8	68.7	59.8	68.7	55.9	63.0	5223	59.6
1986	0.0	1148	0.0	53.7	0.0	53.7	0.0	49.2	0	0.0
1987	0.0	1148	0.0	44.0	0.0	44.0	0.0	40.4	0	0.0
1988	3934.7	1148	59.4	46.4	59.4	46.4	39.0	40.2	5097	58.0
1989	6067.7	1148	70.7	49.6	70.7	49.6	60.3	42.8	6103	69.7
1990	7185.5	1148	79.1	53.0	79.1	53.0	71.5	46.2	6864	78.4
1991	9318.9	1122	96.9	57.5	96.9	57.5	94.8	51.2	8482	96.8
1992	7276.1	1122	80.3	59.6	80.3	59.6	73.8	53.3	7031	80.0
1993	2094.4	1122	26.3	56.8	26.3	56.8	21.3	50.6	2213	25.3
1994	5849.4	1106	61.8	57.2	61.8	57.2	60.4	51.3	5415	61.8
1995	8887.7	1106	92.1	59.7	92.1	59.7	91.7	54.2	8064	92.1
1996	7682.5	1108	78.6	61.0	78.6	61.0	78.9	55.9	6894	78.5
1997	8725.6	1117	91.5	62.9	91.5	62.9	89.2	58.0	8001	91.3
1998	9799.6	1117	98.8	65.0	98.8	65.0	100.1	60.5	8656	98.8
1999	8979.0	1117	93.7	66.7	93.7	66.7	91.8	62.2	8203	93.6
2000	9058.3	1117	92.9	68.1	92.9	68.1	92.3	63.8	8158	92.9
2001	9939.9	1117	100.0	69.7	100.0	69.7	101.6	65.7	8760	100.0
2002	8542.0	1126	87.3	70.5	87.3	70.5	87.1	66.8	7640	87.2
2003	8258.3	1126	84.6	71.2	84.6	71.2	83.7	67.6	7401	84.5
2004	9464.9	1124	95.1	72.2	95.1	72.2	95.9	68.8	8353	95.1
2005	8922.6	1127	89.8	73.0	89.8	73.0	90.4	69.7	7867	89.8

2006	8914.7	1127	90.6	73.7	90.6	73.7	90.3	70.6	7931	90.5
2007	9892.4	1126	99.2	74.7	99.2	74.7	100.3	71.7	8692	99.2
2008	8752.6	1126	88.2	75.2	88.2	75.2	88.5	72.3	7749	88.2
2009	8792.4	1126	89.5	75.7	89.5	75.7	89.1	73.0	7837	89.5
2010	9536.7	1126	97.9	76.5	97.9	76.5	96.7	73.8	8573	97.9
2011	8799.5	1126	91.5	77.0	91.5	77.0	89.2	74.3	8016	91.5
2012	7640.5	1125	78.2	77.0	78.2	77.0	77.3	74.4	6866	78.2
2013	9661.1	1126	97.2	77.7	97.2	77.7	97.9	75.1	8519	97.2
2014	8840.6	1125	89.8	78.0	89.8	78.0	89.7	75.6	7867	89.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1982 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					411	
C. Inspection, maintenance or repair combined with refuelling	892			706		
D. Inspection, maintenance or repair without refuelling				32		
E. Testing of plant systems or components				1		
H. Nuclear regulatory requirements					361	
L. Human factor related					23	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					0	
Z. Other					339	
Subtotal	892	0	0	739	1134	0
Total		892			1873	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1982 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		7
14. Safety Systems		1
15. Reactor Cooling Systems		41
16. Steam generation systems		21
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		53
35. All other I&C Systems		1
41. Main Generator Systems		224
42. Electrical Power Supply Systems		21
XX. Miscellaneous Systems		1
Total	0	405

# US-498 SOUTH TEXAS-1

Operator: STP (STP Nuclear Operating Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1280.0 MW(e)  
 Design Net Capacity: 1250.0 MW(e)  
 Design Discharge Burnup: 43000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9075.1 GW(e)·h  
 Energy Availability Factor: 78.7%  
 Load Factor: 80.9%  
 Operating Factor: 78.7%  
 Energy Unavailability Factor: 21.3%  
 Total Off-line Time: 1866 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	997.0	901.2	476.5	0.0	0.8	876.0	968.1	967.6	942.5	985.1	964.0	996.4	9075.1
EAF (%)	100.0	100.0	48.2	0.0	0.0	97.6	100.0	100.0	100.0	100.0	100.0	100.0	78.7
UCF (%)	100.0	100.0	48.2	0.0	0.0	97.6	100.0	100.0	100.0	100.0	100.0	100.0	78.7
LF (%)	104.7	104.8	50.1	0.0	0.1	95.1	101.7	101.6	102.3	103.4	104.5	104.6	80.9
OF (%)	100.0	100.0	48.2	0.0	0.0	97.6	100.0	100.0	100.0	100.0	100.0	100.0	78.7
EUf (%)	0.0	0.0	51.8	100.0	100.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	21.3
PUf (%)	0.0	0.0	51.8	100.0	100.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	21.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 22 Dec 1975      Lifetime Generation: 241545.3 GW(e)·h  
 Date of First Criticality: 08 Mar 1988      Cumulative Energy Availability Factor: 82.7%  
 Date of Grid Connection: 30 Mar 1988      Cumulative Load Factor: 82.9%  
 Date of Commercial Operation: 25 Aug 1988      Cumulative Unit Capability Factor: 82.7%  
    Cumulative Energy Unavailability Factor: 17.3%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1988	2791.5	1250	77.7	77.7	77.7	77.7	72.1	72.1	2404	77.6
1989	6307.7	1250	63.1	66.9	63.1	66.9	57.6	61.4	5524	63.1
1990	6072.9	1251	59.4	63.7	59.4	63.7	55.4	58.9	5198	59.3
1991	7239.8	1251	69.3	65.4	69.3	65.4	66.1	61.0	6069	69.3
1992	7265.1	1251	68.7	66.1	68.7	66.1	66.1	62.2	6033	68.7
1993	666.0	1251	7.7	55.2	7.7	55.2	6.1	51.7	676	7.7
1994	8251.4	1251	78.2	58.8	78.2	58.8	75.3	55.4	6842	78.1
1995	9301.8	1251	86.5	62.6	86.5	62.6	84.9	59.4	7570	86.4
1996	10226.8	1251	93.5	66.3	93.5	66.3	93.1	63.5	8213	93.5
1997	9873.2	1251	91.6	69.0	91.6	69.0	90.1	66.3	8019	91.5
1998	10859.9	1250	99.8	72.0	99.8	72.0	99.1	69.5	8739	99.8
1999	9645.4	1250	89.7	73.5	89.7	73.5	88.1	71.1	7857	89.7
2000	8591.9	1250	78.6	74.0	78.6	74.0	78.3	71.7	6905	78.6
2001	10338.2	1250	94.1	75.5	94.1	75.5	94.4	73.4	8240	94.1
2002	10867.9	1250	97.9	77.0	97.9	77.0	99.0	75.2	8573	97.9
2003	6858.8	1250	62.3	76.1	62.3	76.1	62.6	74.4	5433	62.0
2004	11103.6	1250	99.2	77.5	99.2	77.5	101.1	76.0	8712	99.2
2005	9901.9	1280	89.6	78.2	89.6	78.2	88.3	76.7	7845	89.5
2006	10144.5	1280	90.7	78.9	90.7	78.9	90.5	77.5	7942	90.7
2007	11804.8	1280	100.0	80.0	100.0	80.0	105.3	79.0	8760	100.0
2008	10800.6	1280	92.3	80.6	92.3	80.6	96.1	79.8	8108	92.3
2009	10052.2	1280	86.6	80.9	86.6	80.9	89.6	80.3	7582	86.6
2010	11304.1	1280	98.1	81.7	98.1	81.7	100.8	81.2	8588	98.0
2011	10616.2	1280	90.5	82.1	90.5	82.1	94.7	81.8	7909	90.3

2012	10520.7	1280	89.8	82.4	89.8	82.4	93.6	82.3	7891	89.8
2013	11019.5	1280	94.1	82.9	94.1	82.9	98.3	82.9	8247	94.1
2014	9075.1	1280	78.7	82.7	78.7	82.7	80.9	82.9	6894	78.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					597	
C. Inspection, maintenance or repair combined with refuelling	1866			674		
D. Inspection, maintenance or repair without refuelling				77	35	
E. Testing of plant systems or components				5		
H. Nuclear regulatory requirements					14	
L. Human factor related					14	
Z. Other				0		
Subtotal	1866	0	0	756	660	0
Total	1866			1416		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		7
14. Safety Systems		345
15. Reactor Cooling Systems		9
17. Safety I&C Systems (excluding reactor I&C)		119
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		17
35. All other I&C Systems		6
41. Main Generator Systems		61
42. Electrical Power Supply Systems		5
Total	0	593

## US-499 SOUTH TEXAS-2

Operator: STP (STP Nuclear Operating Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1280.0 MW(e)  
 Design Net Capacity: 1250.0 MW(e)  
 Design Discharge Burnup: 43000 MW·d/t  
 Status at end of year: Operational

### 2. Production Summary 2014

Net Energy Production: 11628.7 GW(e)·h  
 Energy Availability Factor: 100.0%  
 Load Factor: 103.7%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.0%  
 Total Off-line Time: 0 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	1001.8	904.5	996.1	957.6	983.1	946.0	972.6	972.0	946.2	981.8	968.1	998.9	11628.7
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	105.2	105.2	104.7	103.9	103.2	102.6	102.1	102.1	102.7	103.1	104.9	104.9	103.7
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 22 Dec 1975      Lifetime Generation: 231485.8 GW(e)·h  
 Date of First Criticality: 12 Mar 1989      Cumulative Energy Availability Factor: 82.0%  
 Date of Grid Connection: 11 Apr 1989      Cumulative Load Factor: 81.9%  
 Date of Commercial Operation: 19 Jun 1989      Cumulative Unit Capability Factor: 82.0%  
    Cumulative Energy Unavailability Factor: 18.0%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	3026.7	1250	60.5	60.5	60.5	60.5	51.5	51.5	2845	60.5
1990	6452.2	1251	62.8	62.0	62.8	62.0	58.9	56.3	5494	62.7
1991	7268.0	1251	70.0	65.2	70.0	65.2	66.3	60.2	6134	70.0
1992	10341.0	1251	97.3	74.3	97.3	74.3	94.1	69.8	8548	97.3
1993	690.3	1251	8.0	59.7	8.0	59.7	6.3	55.8	702	8.0
1994	5991.0	1251	58.2	59.4	58.2	59.4	54.7	55.6	5098	58.2
1995	9923.1	1251	91.2	64.3	91.2	64.3	90.5	61.0	7985	91.2
1996	10457.9	1251	95.3	68.4	95.3	68.4	95.2	65.5	8373	95.3
1997	9972.9	1251	92.4	71.2	92.4	71.2	91.0	68.5	8093	92.4
1998	9983.9	1250	92.5	73.4	92.5	73.4	91.1	70.9	8096	92.4
1999	9799.3	1250	91.7	75.2	91.7	75.2	89.5	72.6	8034	91.7
2000	10557.2	1250	96.2	77.0	96.2	77.0	96.1	74.7	8449	96.2
2001	9537.6	1250	88.5	77.9	88.5	77.9	87.1	75.7	7751	88.5
2002	8219.8	1250	75.9	77.8	75.9	77.8	75.1	75.6	6663	76.1
2003	8920.2	1250	81.1	78.0	81.1	78.0	81.5	76.0	7112	81.2
2004	10304.1	1250	92.3	78.9	92.3	78.9	93.8	77.2	8121	92.5
2005	9937.2	1280	89.8	79.6	89.8	79.6	88.6	77.9	7866	89.8
2006	11226.0	1280	100.0	80.8	100.0	80.8	100.1	79.2	8760	100.0
2007	10373.7	1280	90.7	81.3	90.7	81.3	92.5	79.9	7943	90.7
2008	10739.1	1280	91.6	81.9	91.6	81.9	95.5	80.7	8047	91.6
2009	11303.9	1280	97.0	82.6	97.0	82.6	100.8	81.7	8498	97.0
2010	9822.7	1280	84.2	82.7	84.2	82.7	87.6	82.0	7371	84.1
2011	9823.1	1280	84.6	82.8	84.6	82.8	87.6	82.2	7408	84.6
2012	8122.5	1280	69.1	82.2	69.1	82.2	72.2	81.8	6073	69.1

2013	7046.8	1280	60.9	81.3	60.9	81.3	62.8	81.0	5338	60.9
2014	11628.7	1280	100.0	82.0	100.0	82.0	103.7	81.9	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					666	
C. Inspection, maintenance or repair combined with refuelling				792		
D. Inspection, maintenance or repair without refuelling				72		
E. Testing of plant systems or components				1		
H. Nuclear regulatory requirements					1	
L. Human factor related					7	
Z. Other					5	
Subtotal	0	0	0	865	679	0
Total	0			1544		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		8
14. Safety Systems		155
15. Reactor Cooling Systems		7
16. Steam generation systems		12
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		89
32. Feedwater and Main Steam System		41
33. Circulating Water System		1
35. All other I&C Systems		7
41. Main Generator Systems		168
42. Electrical Power Supply Systems		151
XX. Miscellaneous Systems		12
Total	0	661

# US-335 ST. LUCIE-1

Operator: FPL (Florida Power &amp; Light Co.)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 982.0 MW(e)  
 Design Net Capacity: 830.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8721.2 GW(e)·h  
 Energy Availability Factor: 100.0%  
 Load Factor: 101.4%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.0%  
 Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	747.5	675.6	748.2	721.9	742.5	712.1	735.2	734.0	701.4	733.1	723.4	746.5	8721.2
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	102.3	102.4	102.5	102.1	101.6	100.7	100.6	100.5	99.2	100.3	102.2	102.2	101.4
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jul 1970      Lifetime Generation: 229737.0 GW(e)·h  
 Date of First Criticality: 22 Apr 1976      Cumulative Energy Availability Factor: 82.6%  
 Date of Grid Connection: 07 May 1976      Cumulative Load Factor: 82.0%  
 Date of Commercial Operation: 21 Dec 1976      Cumulative Unit Capability Factor: 82.8%  
    Cumulative Energy Unavailability Factor: 17.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1976	99.0	814	100.0	100.0	100.0	100.0	16.6	16.6	264	35.5
1977	5343.7	779	78.4	80.1	78.4	80.1	78.3	73.3	7414	84.6
1978	5009.7	777	73.7	77.0	73.7	77.0	73.6	73.5	6674	76.2
1979	4889.6	777	71.7	75.3	71.7	75.3	71.8	72.9	6469	73.8
1980	5201.9	777	76.0	75.5	76.0	75.5	76.2	73.7	6797	77.4
1981	4954.7	777	70.5	74.5	70.5	74.5	72.8	73.6	6364	72.6
1982	6784.6	803	94.1	77.8	94.1	77.8	96.5	77.4	8227	93.9
1983	1099.5	820	15.4	68.6	15.4	68.6	15.3	68.3	1350	15.4
1984	4243.3	822	60.8	67.6	58.6	67.3	58.8	67.1	5154	58.7
1985	5868.6	825	80.4	69.1	80.4	68.8	81.1	68.7	7067	80.7
1986	7052.0	829	95.7	71.8	95.7	71.6	97.1	71.6	8351	95.3
1987	5719.2	839	77.8	72.4	77.8	72.2	77.8	72.2	6812	77.8
1988	6256.0	839	84.4	73.4	84.4	73.2	84.9	73.3	7407	84.3
1989	6947.3	839	94.3	75.1	94.3	74.9	94.5	75.0	8257	94.3
1990	4503.5	839	64.3	74.3	64.3	74.1	61.3	74.0	5463	62.4
1991	5793.3	839	80.9	74.7	80.9	74.6	78.8	74.3	7089	80.9
1992	7142.2	839	96.5	76.1	96.5	76.0	96.9	75.7	8479	96.5
1993	5440.5	839	76.6	76.2	76.2	76.0	74.0	75.6	6678	76.2
1994	6183.6	839	86.8	76.8	86.8	76.6	84.1	76.1	7600	86.8
1995	5519.4	839	76.2	76.7	76.2	76.6	75.1	76.1	6662	76.1
1996	5222.0	839	73.8	76.6	73.8	76.5	70.9	75.8	6472	73.7
1997	5717.7	839	78.1	76.7	78.1	76.5	77.8	75.9	6842	78.1
1998	7035.5	839	95.8	77.5	95.8	77.4	95.7	76.8	8393	95.8
1999	6532.7	839	89.9	78.1	88.5	77.9	88.9	77.3	7752	88.5



2000	7513.7	839	100.0	79.0	100.0	78.9	102.0	78.4	8784	100.0
2001	6709.8	839	90.4	79.5	90.4	79.3	91.3	78.9	7915	90.4
2002	6919.4	839	93.2	80.0	93.2	79.9	94.1	79.5	8163	93.2
2003	7504.8	839	100.0	80.8	100.0	80.6	102.1	80.4	8760	100.0
2004	6324.3	839	90.4	81.1	85.6	80.8	85.8	80.6	7518	85.6
2005	6088.1	839	82.4	81.2	82.4	80.9	82.8	80.6	7217	82.4
2006	7463.3	839	100.0	81.8	100.0	81.5	101.5	81.3	8760	100.0
2007	6235.8	839	84.7	81.9	84.7	81.6	84.8	81.5	7417	84.7
2008	6673.0	839	89.6	82.1	89.6	81.9	90.5	81.7	7872	89.6
2009	7369.2	839	100.0	82.7	100.0	82.4	100.3	82.3	8760	100.0
2010	5302.7	839	77.8	82.5	77.8	82.3	72.1	82.0	6813	77.8
2011	6241.0	839	88.1	82.7	88.1	82.5	84.9	82.1	7719	88.1
2012	4912.6	982	69.7	82.3	69.7	82.1	59.1	81.4	5821	66.3
2013	6980.4	982	81.1	82.3	81.1	82.0	81.1	81.4	7104	81.1
2014	8721.2	982	100.0	82.8	100.0	82.6	101.4	82.0	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1976 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					340	
C. Inspection, maintenance or repair combined with refuelling				1098		
D. Inspection, maintenance or repair without refuelling				82		
E. Testing of plant systems or components				3		
L. Human factor related					19	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						25
Z. Other				0	3	
Subtotal	0	0	0	1183	362	25
Total	0			1570		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1976 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		125
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		12
14. Safety Systems		4
15. Reactor Cooling Systems		95
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		14
32. Feedwater and Main Steam System		23
33. Circulating Water System		2
41. Main Generator Systems		11
42. Electrical Power Supply Systems		19
XX. Miscellaneous Systems		14
Total	0	333

**US-389 ST. LUCIE-2**

Operator: FPL (Florida Power &amp; Light Co.)

Contractor: CE (COMBUSTION ENGINEERING CO.)

**1. Station Details**

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 987.0 MW(e)

Design Net Capacity: 830.0 MW(e)

Design Discharge Burnup: 36000 MW·d/t

Status at end of year: Operational

**2. Production Summary 2014**

Net Energy Production: 7096.4 GW(e)·h

Energy Availability Factor: 81.3%

Load Factor: 82.1%

Operating Factor: 81.3%

Energy Unavailability Factor: 18.7%

Total Off-line Time: 1639 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	756.1	685.0	39.1	137.0	751.7	705.8	601.3	619.1	718.6	746.5	580.5	755.8	7096.4
EAF (%)	100.0	100.0	6.5	23.5	100.0	100.0	81.2	84.8	100.0	100.0	80.6	100.0	81.3
UCF (%)	100.0	100.0	6.5	23.5	100.0	100.0	81.2	84.8	100.0	100.0	80.6	100.0	81.3
LF (%)	103.0	103.3	5.3	19.3	102.4	99.3	81.9	84.3	101.1	101.7	81.6	102.9	82.1
OF (%)	100.0	100.0	6.5	23.5	100.0	100.0	81.2	84.8	100.0	100.0	80.6	100.0	81.3
EUUF (%)	0.0	0.0	93.5	76.5	0.0	0.0	18.8	15.2	0.0	0.0	19.4	0.0	18.7
PUF (%)	0.0	0.0	93.5	76.5	0.0	0.0	18.8	15.2	0.0	0.0	0.0	0.0	17.1
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.4	0.0	1.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

Date of Construction Start: 02 Jun 1977      Lifetime Generation: 196994.7 GW(e)·h

Date of First Criticality: 02 Jun 1983      Cumulative Energy Availability Factor: 85.3%

Date of Grid Connection: 13 Jun 1983      Cumulative Load Factor: 84.6%

Date of Commercial Operation: 08 Aug 1983      Cumulative Unit Capability Factor: 85.6%

   Cumulative Energy Unavailability Factor: 14.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	2397.5	808	89.4	89.4	89.4	89.4	87.0	87.0	3129	89.3
1984	5564.8	786	82.9	84.7	79.5	82.3	80.6	82.4	7067	80.5
1985	6108.6	824	83.9	84.4	83.9	83.0	84.6	83.4	7368	84.1
1986	6151.2	837	82.8	83.9	82.8	82.9	83.9	83.5	7253	82.8
1987	5950.2	839	82.3	83.5	82.3	82.8	81.0	82.9	7206	82.3
1988	7407.1	839	100.0	86.6	100.0	86.0	100.5	86.2	8784	100.0
1989	5443.4	839	74.6	84.7	74.6	84.2	74.1	84.3	6531	74.6
1990	5341.5	839	74.1	83.3	74.1	82.8	72.7	82.7	6487	74.1
1991	7428.7	839	100.0	85.3	100.0	84.9	101.1	84.9	8760	100.0
1992	5431.2	839	75.1	84.2	75.1	83.9	73.7	83.7	6598	75.1
1993	4719.9	839	76.4	83.4	76.4	83.1	64.2	81.8	6687	76.3
1994	5607.4	839	79.6	83.1	79.6	82.8	76.3	81.3	6971	79.6
1995	5295.9	839	75.0	82.4	75.0	82.2	72.1	80.6	6570	75.0
1996	6984.8	839	96.2	83.5	96.2	83.2	94.8	81.7	8444	96.1
1997	6498.9	839	88.6	83.8	88.6	83.6	88.4	82.1	7756	88.5
1998	6739.5	839	91.4	84.3	91.4	84.1	91.7	82.7	8009	91.4
1999	7213.0	839	98.0	85.2	98.0	85.0	98.1	83.7	8583	98.0
2000	6804.3	839	91.6	85.5	91.6	85.4	92.3	84.2	8041	91.5
2001	6707.5	839	91.1	85.8	91.1	85.7	91.3	84.6	7979	91.1
2002	7425.0	839	99.8	86.6	99.8	86.4	101.0	85.4	8742	99.8
2003	5891.3	839	81.3	86.3	81.3	86.1	80.2	85.2	7120	81.3
2004	6781.4	839	98.2	86.9	91.8	86.4	92.0	85.5	8059	91.7
2005	6283.1	839	87.9	86.9	86.8	86.4	85.5	85.5	7602	86.8
2006	6048.2	839	84.9	86.8	84.9	86.4	82.3	85.4	7434	84.9

2007	5170.5	839	71.2	86.2	71.2	85.7	70.3	84.7	6232	71.1
2008	7087.3	839	95.2	86.5	95.2	86.1	96.2	85.2	8361	95.2
2009	5906.5	839	76.7	86.2	76.7	85.8	80.4	85.0	6721	76.7
2010	7331.3	839	98.1	86.6	98.1	86.2	99.7	85.5	8589	98.0
2011	4279.1	839	64.8	85.8	64.8	85.5	58.2	84.6	5674	64.8
2012	5096.8	839	69.5	85.3	69.5	84.9	69.2	84.1	6101	69.5
2013	8641.8	987	99.1	85.8	98.3	85.4	99.9	84.7	8583	98.0
2014	7096.4	987	81.3	85.6	81.3	85.3	82.1	84.6	7121	81.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		140			276	
C. Inspection, maintenance or repair combined with refuelling	1245			864		
D. Inspection, maintenance or repair without refuelling	252			40		
E. Testing of plant systems or components				1	0	
H. Nuclear regulatory requirements					0	
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					5	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						32
P. Fire					1	
Z. Other				0	12	
Subtotal	1497	140	0	905	294	32
Total	1637			1231		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		34
14. Safety Systems		11
15. Reactor Cooling Systems		122
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		40
32. Feedwater and Main Steam System	140	47
33. Circulating Water System		1
41. Main Generator Systems		13
42. Electrical Power Supply Systems		2
Total	140	272

# US-395 SUMMER-1

Operator: SCE&amp;G (SOUTH CAROLINA ELECTRIC &amp; GAS CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 971.0 MW(e)  
 Design Net Capacity: 900.0 MW(e)  
 Design Discharge Burnup: 38900 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6914.8 GW(e)·h  
 Energy Availability Factor: 80.8%  
 Load Factor: 81.3%  
 Operating Factor: 80.8%  
 Energy Unavailability Factor: 19.2%  
 Total Off-line Time: 1682 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	735.1	664.8	735.7	80.4	2.7	690.5	391.2	729.1	705.6	732.8	712.4	734.6	6914.8
EAF (%)	100.0	100.0	100.0	13.3	1.6	100.0	56.2	100.0	100.0	100.0	100.0	100.0	80.8
UCF (%)	100.0	100.0	100.0	13.3	1.6	100.0	56.2	100.0	100.0	100.0	100.0	100.0	80.8
LF (%)	101.8	101.9	102.0	11.5	0.4	98.8	54.2	100.9	100.9	101.4	101.8	101.7	81.3
OF (%)	100.0	100.0	100.0	13.3	1.6	100.0	56.2	100.0	100.0	100.0	100.0	100.0	80.8
EUf (%)	0.0	0.0	0.0	86.7	98.4	0.0	43.8	0.0	0.0	0.0	0.0	0.0	19.2
PUf (%)	0.0	0.0	0.0	86.7	98.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	43.8	0.0	0.0	0.0	0.0	0.0	3.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 21 Mar 1973      Lifetime Generation: 215956.6 GW(e)·h  
 Date of First Criticality: 22 Oct 1982      Cumulative Energy Availability Factor: 85.4%  
 Date of Grid Connection: 16 Nov 1982      Cumulative Load Factor: 83.4%  
 Date of Commercial Operation: 01 Jan 1984      Cumulative Unit Capability Factor: 85.4%  
    Cumulative Energy Unavailability Factor: 14.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1984	4208.6	900	61.3	61.3	61.3	61.3	53.2	53.2	5362	61.0
1985	5235.1	885	71.6	66.4	71.6	66.4	67.5	60.3	6272	71.6
1986	7160.6	885	95.3	76.0	95.3	76.0	92.4	70.9	8346	95.3
1987	5168.1	885	70.1	74.5	70.1	74.5	66.7	69.9	6135	70.0
1988	5068.2	885	67.8	73.2	67.8	73.2	65.2	68.9	5952	67.8
1989	5412.8	885	80.8	74.4	80.8	74.4	69.8	69.1	7073	80.7
1990	6117.3	885	82.9	75.6	82.9	75.6	78.9	70.5	7261	82.9
1991	5346.1	885	80.7	76.3	80.7	76.3	69.0	70.3	7065	80.7
1992	7515.2	885	97.1	78.6	97.1	78.6	96.7	73.2	8532	97.1
1993	6109.5	885	82.9	79.0	82.9	79.0	78.8	73.8	7258	82.9
1994	4456.0	885	68.8	78.1	68.8	78.1	57.5	72.3	6022	68.7
1995	7561.4	885	96.8	79.6	96.8	79.6	97.5	74.4	8478	96.8
1996	7155.1	923	89.6	80.4	89.6	80.4	88.2	75.5	7829	89.1
1997	7267.9	948	89.9	81.2	89.9	81.2	87.5	76.4	7805	89.1
1998	8188.9	953	98.7	82.4	98.7	82.4	98.1	77.9	8638	98.6
1999	7376.3	954	88.8	82.8	88.8	82.8	88.3	78.6	7779	88.8
2000	6358.8	965	76.2	82.4	76.2	82.4	75.0	78.4	6688	76.1
2001	6757.5	966	81.0	82.3	81.0	82.3	79.9	78.5	7095	81.0
2002	7379.5	966	87.3	82.6	87.3	82.6	87.2	79.0	7645	87.3
2003	7352.1	966	86.4	82.8	86.4	82.8	86.9	79.4	7564	86.3
2004	8243.3	966	95.8	83.5	95.8	83.5	97.1	80.3	8413	95.8
2005	7469.4	966	88.4	83.7	88.4	83.7	88.3	80.7	7746	88.4
2006	7521.4	966	88.9	83.9	88.9	83.9	88.9	81.0	7783	88.8
2007	8479.0	966	99.5	84.6	99.5	84.6	100.2	81.9	8719	99.5

2008	7178.1	966	84.3	84.6	84.3	84.6	84.6	82.0	7404	84.3
2009	6872.0	966	81.6	84.5	81.6	84.5	81.2	82.0	7150	81.6
2010	8487.1	966	99.1	85.0	99.1	85.0	100.3	82.7	8681	99.1
2011	7426.2	966	87.0	85.1	87.0	85.1	87.8	82.9	7622	87.0
2012	7281.6	971	84.9	85.1	84.9	85.1	85.4	82.9	7456	84.9
2013	8369.9	971	97.0	85.5	97.0	85.5	98.4	83.5	8501	97.0
2014	6914.8	971	80.8	85.4	80.8	85.4	81.3	83.4	7078	80.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		326			123	
C. Inspection, maintenance or repair combined with refuelling	1355			947		
D. Inspection, maintenance or repair without refuelling				151		
E. Testing of plant systems or components				2	0	
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					9	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					1	
Z. Other					28	
Subtotal	1355	326	0	1100	161	1
Total		1681			1262	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories	191	
12. Reactor I&C Systems		13
14. Safety Systems		4
15. Reactor Cooling Systems		32
16. Steam generation systems	134	16
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		11
35. All other I&C Systems		1
41. Main Generator Systems		22
42. Electrical Power Supply Systems		10
XX. Miscellaneous Systems		1
Total	325	119

# US-280 SURRY-1

Operator: DOMINION (Dominion Generation)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 838.0 MW(e)

Design Net Capacity: 788.0 MW(e)

Design Discharge Burnup: 48000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 7570.6 GW(e)·h

Energy Availability Factor: 100.0%

Load Factor: 103.1%

Operating Factor: 100.0%

Energy Unavailability Factor: 0.0%

Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	650.6	587.3	649.0	627.7	641.4	611.6	630.8	633.1	615.4	642.1	629.6	651.8	7570.6
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	104.3	104.3	104.2	104.0	102.9	101.4	101.2	101.5	102.0	103.0	104.2	104.5	103.1
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 25 Jun 1968      Lifetime Generation: 223449.6 GW(e)·h

Date of First Criticality: 01 Jul 1972      Cumulative Energy Availability Factor: 77.5%

Date of Grid Connection: 04 Jul 1972      Cumulative Load Factor: 76.2%

Date of Commercial Operation: 22 Dec 1972      Cumulative Unit Capability Factor: 77.6%

   Cumulative Energy Unavailability Factor: 22.5%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1972	280.7	794	100.0	100.0	100.0	100.0	47.9	47.9	496	66.7
1973	3479.7	788	61.9	64.9	61.9	64.9	50.4	50.2	5377	61.4
1974	3318.1	788	54.8	60.0	54.8	60.0	48.1	49.2	4800	54.8
1975	3858.4	788	56.1	58.8	56.1	58.8	56.0	51.4	5343	61.2
1976	4396.8	788	63.6	59.9	63.6	59.9	63.5	54.4	6010	68.4
1977	5023.9	776	74.0	62.7	74.0	62.7	73.9	58.2	6661	76.0
1978	4704.2	775	69.3	63.8	69.3	63.8	69.3	60.0	6291	71.8
1979	2255.1	775	33.2	59.5	33.2	59.5	33.2	56.2	3045	34.8
1980	2472.6	775	42.2	57.4	42.2	57.4	36.3	53.8	3762	42.8
1981	2377.4	775	39.0	55.4	39.0	55.4	35.0	51.7	3403	38.8
1982	5483.1	775	89.2	58.7	89.2	58.7	80.8	54.6	7776	88.8
1983	3517.1	775	56.4	58.5	56.3	58.5	51.8	54.3	5010	57.2
1984	3334.1	775	58.1	58.5	58.1	58.4	49.0	53.9	5138	58.5
1985	5618.3	779	89.3	60.8	89.3	60.8	82.3	56.1	7827	89.3
1986	4488.6	781	68.1	61.3	68.1	61.3	65.6	56.7	6013	68.6
1987	4633.4	781	70.1	61.9	70.1	61.9	67.7	57.5	6113	69.8
1988	2685.0	781	18.7	59.2	18.7	59.2	39.1	56.3	3632	41.3
1989	3170.5	781	46.8	58.5	46.8	58.5	46.3	55.7	4217	48.1
1990	4772.2	781	74.9	59.4	74.9	59.4	69.8	56.5	6655	76.0
1991	6590.9	781	100.0	61.5	100.0	61.5	96.3	58.6	8760	100.0
1992	5223.8	781	79.6	62.4	79.6	62.4	76.1	59.5	7033	80.1
1993	6229.2	781	95.9	64.0	95.9	64.0	91.1	61.0	8402	95.9
1994	4881.9	781	74.3	64.5	74.3	64.5	71.4	61.5	6560	74.9
1995	5747.0	784	85.4	65.4	85.4	65.4	83.6	62.4	7505	85.7

1996	7137.8	801	100.0	66.9	100.0	66.9	101.4	64.1	8784	100.0
1997	5640.5	801	80.7	67.4	80.7	67.4	80.4	64.8	7067	80.7
1998	5752.4	801	81.9	68.0	81.9	68.0	82.0	65.4	7170	81.8
1999	7116.2	801	100.0	69.2	100.0	69.2	101.4	66.8	8760	100.0
2000	6548.4	801	93.2	70.1	93.2	70.1	93.1	67.7	8188	93.2
2001	5941.6	810	84.3	70.6	84.3	70.6	83.7	68.3	7380	84.2
2002	7149.5	810	100.0	71.6	100.0	71.6	100.8	69.4	8760	100.0
2003	5419.8	810	77.0	71.8	77.0	71.8	76.4	69.7	6741	77.0
2004	6457.1	810	90.5	72.4	90.5	72.4	90.8	70.3	7943	90.4
2005	6746.6	810	95.6	73.1	95.6	73.1	95.1	71.1	8376	95.6
2006	6311.0	799	90.6	73.6	90.6	73.6	90.2	71.7	7931	90.5
2007	6195.2	799	88.1	74.0	88.1	74.0	88.5	72.2	7720	88.1
2008	6890.5	799	97.5	74.7	97.5	74.7	98.2	72.9	8560	97.4
2009	6597.3	799	93.8	75.2	93.8	75.2	94.3	73.5	8214	93.8
2010	6206.4	839	88.3	75.6	88.3	75.6	88.3	73.9	7724	88.2
2011	7423.8	839	100.0	76.2	98.1	76.2	101.0	74.6	8590	98.1
2012	6839.5	838	91.3	76.6	91.3	76.6	92.9	75.1	8019	91.3
2013	6836.4	838	91.1	77.0	91.1	76.9	93.1	75.5	7980	91.1
2014	7570.6	838	100.0	77.6	100.0	77.5	103.1	76.2	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					495	
C. Inspection, maintenance or repair combined with refuelling				806		
D. Inspection, maintenance or repair without refuelling				364		
E. Testing of plant systems or components				1	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements					171	
L. Human factor related					16	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						5
Z. Other					105	
Subtotal	0	0	0	1171	787	5
Total	0			1963		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		28
13. Reactor Auxiliary Systems		6
14. Safety Systems		4
15. Reactor Cooling Systems		172
16. Steam generation systems		50
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		19
32. Feedwater and Main Steam System		80
41. Main Generator Systems		6
42. Electrical Power Supply Systems		79
XX. Miscellaneous Systems		44
Total	0	490

# US-281 SURRY-2

Operator: DOMINION (Dominion Generation)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR

Net Reference Unit Power (RUP) at the beginning of 2014: 838.0 MW(e)

Design Net Capacity: 788.0 MW(e)

Design Discharge Burnup: 48000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6761.8 GW(e)·h

Energy Availability Factor: 90.0%

Load Factor: 92.1%

Operating Factor: 90.0%

Energy Unavailability Factor: 10.0%

Total Off-line Time: 878 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	651.2	588.8	580.1	391.9	194.4	612.0	630.0	632.4	613.8	587.5	627.0	652.7	6761.8
EAF (%)	100.0	100.0	91.6	63.3	33.6	100.0	100.0	100.0	100.0	92.1	100.0	100.0	90.0
UCF (%)	100.0	100.0	91.6	63.3	33.6	100.0	100.0	100.0	100.0	92.1	100.0	100.0	90.0
LF (%)	104.4	104.6	93.2	64.9	31.2	101.4	101.0	101.4	101.7	94.2	103.8	104.7	92.1
OF (%)	100.0	100.0	91.7	63.3	33.6	100.0	100.0	100.0	100.0	92.2	100.0	100.0	90.0
EUf (%)	0.0	0.0	8.4	36.7	66.4	0.0	0.0	0.0	0.0	7.9	0.0	0.0	10.0
PUf (%)	0.0	0.0	0.0	36.7	66.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7
UCLF (%)	0.0	0.0	8.4	0.0	0.0	0.0	0.0	0.0	0.0	7.9	0.0	0.0	1.4
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 25 Jun 1968      Lifetime Generation: 221945.4 GW(e)·h

Date of First Criticality: 07 Mar 1973      Cumulative Energy Availability Factor: 77.8%

Date of Grid Connection: 10 Mar 1973      Cumulative Load Factor: 76.4%

Date of Commercial Operation: 01 May 1973      Cumulative Unit Capability Factor: 77.9%

   Cumulative Energy Unavailability Factor: 22.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973	3064.7	790	77.9	77.9	77.9	77.9	66.1	66.1	4533	77.1
1974	2660.5	788	44.0	57.6	44.0	57.6	38.5	49.6	3854	44.0
1975	5053.1	788	73.3	63.5	73.3	63.5	73.2	58.5	6967	79.5
1976	3343.4	788	48.3	59.3	48.3	59.3	48.3	55.7	4585	52.2
1977	4457.3	776	65.6	60.7	65.6	60.7	65.6	57.8	5980	68.3
1978	5372.0	775	79.1	63.9	79.1	63.9	79.1	61.5	7244	82.7
1979	611.5	775	9.0	55.7	9.0	55.7	9.0	53.7	818	9.3
1980	2241.6	775	36.0	53.2	36.0	53.2	32.9	51.0	3139	35.7
1981	5150.3	775	82.4	56.5	79.6	56.2	75.9	53.9	6972	79.6
1982	5492.2	775	88.7	59.8	88.7	59.5	80.9	56.6	7729	88.2
1983	4086.1	775	65.0	60.3	65.0	60.0	60.2	57.0	5729	65.4
1984	5209.4	775	83.3	62.3	83.3	62.0	76.5	58.6	7327	83.4
1985	4072.4	775	65.8	62.5	65.8	62.3	60.0	58.7	5857	66.9
1986	4498.9	780	68.7	63.0	68.7	62.8	65.8	59.3	6072	69.3
1987	4791.0	781	73.6	63.7	73.6	63.5	70.0	60.0	6456	73.7
1988	3570.9	781	56.6	63.3	56.6	63.1	52.1	59.5	4993	56.8
1989	893.6	781	13.3	60.3	13.3	60.1	13.1	56.7	1355	15.5
1990	5837.8	781	84.8	61.6	84.8	61.5	85.3	58.3	7919	90.4
1991	3985.2	781	66.6	61.9	66.6	61.8	58.3	58.3	5886	67.2
1992	6426.5	781	96.3	63.7	96.3	63.5	93.7	60.1	8470	96.4
1993	4541.7	781	71.0	64.0	71.0	63.9	66.4	60.4	6283	71.7
1994	6261.0	781	94.1	65.4	94.1	65.3	91.5	61.9	8251	94.2
1995	5517.4	787	80.6	66.1	80.6	66.0	80.0	62.7	7087	80.9
1996	6081.5	801	85.9	66.9	85.9	66.8	86.4	63.7	7539	85.8



1997	6451.3	801	91.7	68.0	91.7	67.9	91.9	64.9	8034	91.7
1998	7178.9	801	100.0	69.3	100.0	69.1	102.3	66.4	8760	100.0
1999	5874.8	801	85.6	69.9	85.6	69.8	83.7	67.0	7493	85.5
2000	6539.4	801	91.3	70.7	91.3	70.6	92.9	68.0	8022	91.3
2001	6720.7	815	93.7	71.5	93.7	71.4	94.1	68.9	8203	93.6
2002	6523.7	815	91.0	72.2	91.0	72.1	91.4	69.7	7966	90.9
2003	5612.1	815	78.3	72.4	78.3	72.3	78.6	70.0	6861	78.3
2004	7051.7	815	98.0	73.2	98.0	73.1	98.5	70.9	8606	98.0
2005	6488.5	815	91.9	73.8	91.9	73.7	90.9	71.6	8046	91.8
2006	6189.4	799	88.0	74.2	88.0	74.2	88.4	72.1	7705	88.0
2007	7086.3	799	100.0	75.0	100.0	74.9	101.2	72.9	8760	100.0
2008	6606.8	799	93.4	75.5	93.4	75.4	94.1	73.5	8205	93.4
2009	6412.3	799	91.6	76.0	91.6	75.9	91.6	74.0	8026	91.6
2010	6966.0	799	98.7	76.6	98.7	76.5	99.5	74.7	8646	98.7
2011	5605.7	839	77.9	76.6	77.9	76.5	78.1	74.8	6771	77.3
2012	6775.1	838	91.1	77.0	91.1	76.9	92.0	75.3	8001	91.1
2013	7568.2	838	100.0	77.6	100.0	77.5	103.1	76.0	8760	100.0
2014	6761.8	838	90.0	77.9	90.0	77.8	92.1	76.4	7882	90.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1973 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		120			486	
C. Inspection, maintenance or repair combined with refuelling	758			1146		
D. Inspection, maintenance or repair without refuelling				203		
E. Testing of plant systems or components				0		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirements					21	
L. Human factor related					16	
Z. Other				4	0	
Subtotal	758	120	0	1353	523	0
Total		878			1876	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1973 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems	58	21
13. Reactor Auxiliary Systems		3
14. Safety Systems		59
15. Reactor Cooling Systems	62	21
16. Steam generation systems		118
31. Turbine and auxiliaries		102
32. Feedwater and Main Steam System		106
33. Circulating Water System		2
35. All other I&C Systems		1
41. Main Generator Systems		4
42. Electrical Power Supply Systems		25
XX. Miscellaneous Systems		17
Total	120	479

# US-387 SUSQUEHANNA-1

Operator: PPL\_SUSQ (PPL Susquehanna, LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1257.0 MW(e)

Design Net Capacity: 1065.0 MW(e)

Design Discharge Burnup: 36000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9150.8 GW(e)·h

Energy Availability Factor: 83.1%

Load Factor: 83.1%

Operating Factor: 83.1%

Energy Unavailability Factor: 16.9%

Total Off-line Time: 1484 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	961.5	838.3	952.5	336.3	0.0	678.6	944.5	888.4	918.6	945.9	933.3	752.8	9150.8
EAF (%)	100.0	100.0	100.0	37.1	0.0	80.1	100.0	100.0	100.0	100.0	100.0	80.7	83.1
UCF (%)	100.0	100.0	100.0	37.1	0.0	80.1	100.0	100.0	100.0	100.0	100.0	80.7	83.1
LF (%)	102.8	99.2	102.0	37.2	0.0	75.0	101.0	95.0	101.5	101.1	103.0	80.5	83.1
OF (%)	100.0	100.0	100.0	37.1	0.0	80.1	100.0	100.0	100.0	100.0	100.0	80.6	83.1
EUf (%)	0.0	0.0	0.0	62.9	100.0	19.9	0.0	0.0	0.0	0.0	0.0	19.3	16.9
PUf (%)	0.0	0.0	0.0	62.9	100.0	19.9	0.0	0.0	0.0	0.0	0.0	0.0	15.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.3	1.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 02 Nov 1973      Lifetime Generation: 253757.2 GW(e)·h

Date of First Criticality: 10 Sep 1982      Cumulative Energy Availability Factor: 83.9%

Date of Grid Connection: 16 Nov 1982      Cumulative Load Factor: 82.5%

Date of Commercial Operation: 08 Jun 1983      Cumulative Unit Capability Factor: 84.0%

   Cumulative Energy Unavailability Factor: 16.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1983	3536.4	1034	76.3	76.3	76.3	76.3	66.6	66.6	3766	73.3
1984	6088.1	1032	74.4	75.1	72.0	73.6	67.2	66.9	6377	72.6
1985	5286.4	1032	60.4	69.4	60.4	68.5	58.5	63.7	5469	62.4
1986	5839.2	1032	66.8	68.7	66.8	68.0	64.6	63.9	5992	68.4
1987	6132.9	1032	70.7	69.1	70.7	68.6	67.8	64.8	6331	72.3
1988	8410.1	1032	93.1	73.4	93.1	73.0	92.8	69.8	8206	93.4
1989	6483.9	1032	72.1	73.2	72.1	72.9	71.7	70.1	6447	73.6
1990	6446.7	1033	73.1	73.2	73.1	72.9	71.2	70.2	6528	74.5
1991	8821.6	1035	98.0	76.1	98.0	75.8	97.2	73.4	8596	98.1
1992	6400.3	1040	73.6	75.9	73.6	75.6	70.1	73.0	6568	74.8
1993	5232.4	1040	57.5	74.1	57.5	73.9	57.4	71.6	5205	59.4
1994	8414.5	1040	94.2	75.9	94.2	75.6	92.4	73.4	8249	94.2
1995	7432.3	1073	81.1	76.3	81.1	76.1	79.0	73.8	7126	81.3
1996	7752.9	1090	84.7	76.9	84.7	76.8	81.0	74.4	7434	84.6
1997	9085.3	1090	94.5	78.2	94.5	78.0	95.2	75.9	8274	94.5
1998	7652.8	1090	81.5	78.4	81.5	78.3	80.1	76.2	7015	80.1
1999	8814.5	1090	94.0	79.4	94.0	79.2	92.3	77.2	8234	94.0
2000	8180.6	1090	86.5	79.8	86.5	79.7	85.4	77.6	7598	86.5
2001	9413.0	1090	99.5	80.9	99.5	80.8	98.6	78.8	8718	99.5
2002	8026.6	1105	85.7	81.2	85.7	81.0	83.4	79.1	7493	85.5
2003	9359.9	1105	98.0	82.0	98.0	81.9	96.7	79.9	8585	98.0
2004	8027.0	1135	84.1	82.1	84.1	82.0	81.2	80.0	7359	83.8
2005	9442.6	1105	95.4	82.7	95.4	82.6	97.5	80.8	8357	95.4
2006	8602.7	1135	87.2	82.9	87.2	82.8	86.5	81.1	7639	87.2

2007	9456.3	1149	95.4	83.5	95.4	83.4	94.0	81.6	8349	95.3
2008	9005.7	1149	87.7	83.6	87.7	83.6	89.2	82.0	7704	87.7
2009	10475.5	1185	100.0	84.3	100.0	84.2	100.9	82.7	8760	100.0
2010	8294.4	1239	80.0	84.1	80.0	84.1	77.8	82.5	6958	79.4
2011	9499.0	1260	86.8	84.3	86.8	84.2	86.4	82.7	7588	86.6
2012	7814.9	1257	72.7	83.8	72.7	83.7	70.8	82.2	6382	72.7
2013	9898.6	1257	89.7	84.0	89.7	83.9	89.9	82.5	7860	89.7
2014	9150.8	1257	83.1	84.0	83.1	83.9	83.1	82.5	7276	83.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1983 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		143			246	
C. Inspection, maintenance or repair combined with refuelling	1340			813		
D. Inspection, maintenance or repair without refuelling				139		
E. Testing of plant systems or components				49		
H. Nuclear regulatory requirements					23	
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					32	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				12		
Z. Other				60	23	
Subtotal	1340	143	0	1073	324	6
Total		1483			1403	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1983 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems	143	11
13. Reactor Auxiliary Systems		1
14. Safety Systems		14
15. Reactor Cooling Systems		30
17. Safety I&C Systems (excluding reactor I&C)		7
31. Turbine and auxiliaries		70
32. Feedwater and Main Steam System		28
33. Circulating Water System		14
35. All other I&C Systems		3
41. Main Generator Systems		12
42. Electrical Power Supply Systems		16
XX. Miscellaneous Systems		24
Total	143	240

# US-388 SUSQUEHANNA-2

Operator: PPL\_SUSQ (PPL Susquehanna, LLC)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power (RUP) at the beginning of 2014: 1257.0 MW(e)

Design Net Capacity: 1065.0 MW(e)

Design Discharge Burnup: 36000 MW·d/t

Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9710.3 GW(e)·h

Energy Availability Factor: 88.5%

Load Factor: 88.2%

Operating Factor: 88.5%

Energy Unavailability Factor: 11.5%

Total Off-line Time: 1004 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	956.2	868.7	175.3	929.0	949.4	717.6	766.5	930.3	579.1	949.5	931.8	956.8	9710.3
EAF (%)	100.0	100.0	27.5	100.0	100.0	80.6	85.6	100.0	69.7	100.0	100.0	100.0	88.5
UCF (%)	100.0	100.0	27.5	100.0	100.0	80.6	85.6	100.0	69.7	100.0	100.0	100.0	88.5
LF (%)	102.2	102.8	18.8	102.6	101.5	79.3	82.0	99.5	64.0	101.5	102.8	102.3	88.2
OF (%)	100.0	100.0	27.5	100.0	100.0	80.6	85.6	100.0	69.7	100.0	100.0	100.0	88.5
EUf (%)	0.0	0.0	72.5	0.0	0.0	19.4	14.4	0.0	30.3	0.0	0.0	0.0	11.5
PUf (%)	0.0	0.0	53.6	0.0	0.0	19.4	14.4	0.0	30.3	0.0	0.0	0.0	9.9
UCLF (%)	0.0	0.0	19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 02 Nov 1973      Lifetime Generation: 252443.3 GW(e)·h

Date of First Criticality: 08 May 1984      Cumulative Energy Availability Factor: 87.4%

Date of Grid Connection: 03 Jul 1984      Cumulative Load Factor: 86.1%

Date of Commercial Operation: 12 Feb 1985      Cumulative Unit Capability Factor: 87.4%

   Cumulative Energy Unavailability Factor: 12.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	6954.3	1032	90.6	90.6	90.2	90.2	84.1	84.1	6993	87.2
1986	5458.4	1032	63.5	76.5	63.5	76.3	60.4	71.7	5730	65.4
1987	8598.4	1032	96.0	83.2	96.0	83.0	95.1	79.7	8431	96.2
1988	5915.2	1034	66.3	78.9	66.3	78.8	65.1	76.0	5985	68.1
1989	6777.0	1038	76.9	78.5	76.9	78.4	74.5	75.7	6745	77.0
1990	8290.7	1038	94.4	81.2	94.4	81.1	91.1	78.3	8143	93.0
1991	7041.4	1041	78.4	80.8	78.4	80.7	77.2	78.2	6955	79.4
1992	7186.2	1044	80.2	80.7	80.2	80.6	78.4	78.2	7119	81.0
1993	8337.9	1044	92.3	82.0	92.3	81.9	91.2	79.6	8094	92.4
1994	6909.8	1073	74.7	81.2	74.7	81.2	73.5	79.0	6577	75.1
1995	8192.7	1094	87.8	81.9	87.8	81.8	85.5	79.6	7691	87.8
1996	9127.2	1094	95.0	83.0	95.0	83.0	95.0	81.0	8346	95.0
1997	7732.6	1094	82.4	83.0	82.4	82.9	80.7	80.9	7211	82.3
1998	8820.8	1094	93.3	83.7	93.3	83.7	92.0	81.8	8172	93.3
1999	7794.7	1094	83.0	83.7	83.0	83.7	81.3	81.7	7268	83.0
2000	9347.2	1094	97.8	84.6	97.8	84.6	97.3	82.8	8587	97.8
2001	8397.1	1111	87.9	84.8	87.9	84.8	86.9	83.0	7693	87.8
2002	9306.2	1111	96.4	85.5	96.4	85.4	95.6	83.7	8439	96.3
2003	8654.7	1140	88.2	85.6	88.2	85.6	87.2	83.9	7701	87.9
2004	10057.1	1140	100.0	86.4	100.0	86.4	100.4	84.8	8784	100.0
2005	8885.7	1140	90.2	86.6	90.2	86.6	89.0	85.0	7900	90.2
2006	9270.9	1140	93.1	86.9	93.1	86.9	92.8	85.4	8155	93.1
2007	8781.6	1140	88.2	87.0	88.2	86.9	87.9	85.5	7726	88.2
2008	10091.4	1140	100.0	87.5	100.0	87.5	100.8	86.2	8784	100.0

2009	9011.1	1140	88.8	87.6	88.8	87.6	90.2	86.4	7775	88.8
2010	10221.2	1190	99.2	88.1	99.2	88.1	98.1	86.9	8686	99.2
2011	7951.3	1260	76.1	87.6	76.1	87.6	74.1	86.3	6600	75.3
2012	9195.0	1257	86.6	87.5	86.6	87.5	83.3	86.2	7609	86.6
2013	9076.9	1257	82.8	87.4	82.8	87.3	82.4	86.1	7256	82.8
2014	9710.3	1257	88.5	87.4	88.5	87.4	88.2	86.1	7756	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1984 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		140			231	
C. Inspection, maintenance or repair combined with refuelling				741		
D. Inspection, maintenance or repair without refuelling	863			59		
E. Testing of plant systems or components				62		
L. Human factor related					4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other					8	
Subtotal	863	140	0	862	243	1
Total	1003			1106		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1984 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		15
12. Reactor I&C Systems		14
13. Reactor Auxiliary Systems		5
14. Safety Systems		7
15. Reactor Cooling Systems		14
31. Turbine and auxiliaries		32
32. Feedwater and Main Steam System	140	38
41. Main Generator Systems		24
42. Electrical Power Supply Systems		43
XX. Miscellaneous Systems		35
Total	140	227

# US-289 THREE MILE ISLAND-1

Operator: EXELON (Exelon Generation Co., LLC)

Contractor: B&amp;W (BABCOCK &amp; WILCOX CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 819.0 MW(e)  
 Design Net Capacity: 819.0 MW(e)  
 Design Discharge Burnup: 54000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 7308.9 GW(e)·h  
 Energy Availability Factor: 100.0%  
 Load Factor: 101.9%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.0%  
 Total Off-line Time: 0 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	629.7	534.6	629.7	608.8	614.4	595.7	613.8	616.2	598.7	625.5	610.8	631.0	7308.9
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LF (%)	103.3	97.1	103.5	103.2	100.8	101.0	100.7	101.1	101.5	102.6	103.4	103.6	101.9
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 18 May 1968      Lifetime Generation: 212578.7 GW(e)·h  
 Date of First Criticality: 05 Jun 1974      Cumulative Energy Availability Factor: 75.3%  
 Date of Grid Connection: 19 Jun 1974      Cumulative Load Factor: 75.8%  
 Date of Commercial Operation: 02 Sep 1974      Cumulative Unit Capability Factor: 87.5%  
    Cumulative Energy Unavailability Factor: 24.7%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1974	1992.4	789	88.2	88.2	88.2	88.2	85.9	85.9	2584	88.3
1975	5541.6	792	79.7	81.8	79.7	81.8	79.9	81.4	7198	82.2
1976	4344.4	792	62.5	73.5	62.5	73.5	62.4	73.3	5745	65.4
1977	5466.6	792	78.7	75.1	78.7	75.1	78.8	74.9	7087	80.9
1978	5681.9	788	82.0	76.7	82.0	76.7	82.3	76.6	7454	85.1
1979	888.7	776	12.9	64.9	12.9	64.9	13.1	64.9	1128	12.9
1980	0.0	776	100.0	70.4	0.0	54.8	0.0	54.8	0	0.0
1981	0.0	776	100.0	74.4	0.0	47.4	0.0	47.4	0	0.0
1982	0.0	776	100.0	77.4	0.0	41.8	0.0	41.8	0	0.0
1983	0.0	776	100.0	79.8	0.0	37.3	0.0	37.3	0	0.0
1984	0.0	776	100.0	81.8	0.0	33.8	0.0	33.7	0	0.0
1985	811.7	776	37.8	77.9	37.8	34.1	11.9	31.8	1853	21.2
1986	4818.3	776	70.8	77.3	70.8	37.1	70.9	35.0	6209	70.9
1987	5034.3	776	72.5	77.0	72.5	39.7	74.1	37.9	6351	72.5
1988	5465.4	784	76.0	76.9	76.0	42.2	79.4	40.8	6679	76.0
1989	7216.8	808	99.5	78.4	99.5	46.1	102.0	44.9	8714	99.5
1990	5316.2	808	81.8	78.6	81.8	48.3	75.1	46.8	7123	81.3
1991	5671.2	808	86.4	79.1	86.4	50.6	80.1	48.8	7536	86.0
1992	6936.5	789	99.5	80.2	99.5	53.3	100.0	51.6	8743	99.5
1993	5962.2	786	88.0	80.6	88.0	55.1	86.6	53.4	7702	87.9
1994	6590.9	786	95.3	81.3	95.3	57.1	95.7	55.5	8349	95.3
1995	6388.0	786	90.5	81.8	90.5	58.6	92.8	57.2	7926	90.5
1996	7100.3	786	100.0	82.6	100.0	60.5	102.8	59.3	8784	100.0
1997	5918.8	786	87.3	82.8	87.3	61.6	86.0	60.4	7633	87.1

1998	7059.2	786	100.0	83.5	100.0	63.2	102.5	62.2	8760	100.0
1999	6328.4	786	89.4	83.7	89.4	64.2	91.9	63.3	7827	89.3
2000	7144.9	786	100.0	84.4	100.0	65.6	103.5	64.9	8784	100.0
2001	5416.7	786	80.3	84.2	80.3	66.1	78.7	65.4	7034	80.3
2002	7313.5	802	100.0	84.8	100.0	67.4	104.6	66.8	8760	100.0
2003	6205.1	802	86.7	84.8	86.7	68.0	88.3	67.5	7602	86.8
2004	7273.3	802	100.0	85.3	100.0	69.1	103.2	68.7	8784	100.0
2005	6755.4	786	93.0	85.6	93.0	69.9	98.1	69.7	8145	93.0
2006	7227.0	786	99.1	86.0	98.7	70.8	105.0	70.7	8647	98.7
2007	6645.3	786	91.7	86.2	91.7	71.4	96.5	71.5	8034	91.7
2008	7365.1	786	100.0	86.6	100.0	72.2	106.7	72.5	8784	100.0
2009	5891.6	786	81.7	86.4	81.7	72.5	85.6	72.9	7152	81.6
2010	6633.8	805	92.5	86.6	92.5	73.0	94.1	73.5	8084	92.3
2011	6518.8	805	91.1	86.7	91.1	73.5	92.4	74.0	7975	91.0
2012	7038.3	819	96.0	87.0	96.0	74.1	97.8	74.7	8432	96.0
2013	6679.2	819	92.1	87.1	92.1	74.6	93.1	75.1	8064	92.0
2014	7308.9	819	100.0	87.5	100.0	75.3	101.9	75.8	8760	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1974 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					117	
C. Inspection, maintenance or repair combined with refuelling				595		
D. Inspection, maintenance or repair without refuelling				57		
E. Testing of plant systems or components				8	0	
H. Nuclear regulatory requirements					1609	
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					8	
Subtotal	0	0	0	660	1734	0
Total	0			2394		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1974 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		22
13. Reactor Auxiliary Systems		8
15. Reactor Cooling Systems		27
16. Steam generation systems		5
31. Turbine and auxiliaries		24
32. Feedwater and Main Steam System		12
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator Systems		6
42. Electrical Power Supply Systems		3
XX. Miscellaneous Systems		6
Total	0	114

# US-250 TURKEY POINT-3

Operator: FPL (Florida Power &amp; Light Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 802.0 MW(e)  
 Design Net Capacity: 693.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 5900.8 GW(e)·h  
 Energy Availability Factor: 88.2%  
 Load Factor: 84.0%  
 Operating Factor: 88.2%  
 Energy Unavailability Factor: 11.8%  
 Total Off-line Time: 1034 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	610.2	542.7	295.8	35.4	597.4	492.6	509.5	476.8	561.4	588.6	582.2	608.2	5900.8
EAF (%)	100.0	100.0	51.5	14.8	100.0	100.0	100.0	91.8	100.0	100.0	100.0	100.0	88.2
UCF (%)	100.0	100.0	51.6	14.8	100.0	100.0	100.0	91.8	100.0	100.0	100.0	100.0	88.2
LF (%)	102.3	100.7	49.6	6.1	100.1	85.3	85.4	79.9	97.2	98.6	100.7	101.9	84.0
OF (%)	100.0	100.0	51.5	14.9	100.0	100.0	100.0	91.8	100.0	100.0	100.0	100.0	88.2
EUf (%)	0.0	0.0	48.5	85.2	0.0	0.0	0.0	8.2	0.0	0.0	0.0	0.0	11.8
PUf (%)	0.0	0.0	48.5	85.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	0.0	0.0	0.0	0.0	0.7
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 27 Apr 1967      Lifetime Generation: 190467.3 GW(e)·h  
 Date of First Criticality: 20 Oct 1972      Cumulative Energy Availability Factor: 77.9%  
 Date of Grid Connection: 02 Nov 1972      Cumulative Load Factor: 76.0%  
 Date of Commercial Operation: 14 Dec 1972      Cumulative Unit Capability Factor: 78.0%  
    Cumulative Energy Unavailability Factor: 22.1%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1972	75.0	670	100.0	100.0	100.0	100.0	14.5	14.5	304	40.9
1973	Data not provided									
1974	3478.8	666	100.0	100.0	100.0	100.0	59.6	56.0	6090	69.5
1975	4376.0	666	74.9	88.0	74.9	88.0	75.0	65.1	6948	79.3
1976	4322.0	666	73.9	83.4	73.9	83.4	73.9	67.9	6665	75.9
1977	4474.1	666	76.6	81.8	76.6	81.8	76.7	70.1	6994	79.8
1978	4502.7	666	77.2	80.9	77.2	80.9	77.2	71.5	7087	80.9
1979	2881.6	666	49.4	75.7	49.4	75.7	49.4	67.8	4509	51.5
1980	4389.0	657	77.9	76.0	77.9	76.0	76.1	69.0	6812	77.6
1981	933.2	646	13.2	68.4	13.2	68.4	16.5	62.7	1385	15.8
1982	3771.4	646	64.2	68.0	64.2	68.0	66.6	63.1	5612	64.1
1983	4331.0	659	73.3	68.5	73.3	68.5	75.0	64.3	6415	73.2
1984	4784.2	666	82.6	69.8	82.6	69.8	81.8	65.9	7253	82.6
1985	3421.0	666	61.0	69.1	59.7	69.0	58.6	65.3	5224	59.6
1986	4513.1	666	77.9	69.7	77.9	69.6	77.4	66.2	6816	77.8
1987	885.3	666	17.9	66.0	17.9	66.0	15.2	62.6	1566	17.9
1988	3468.0	666	60.6	65.7	60.6	65.6	59.3	62.3	5320	60.6
1989	3605.1	666	65.1	65.6	65.1	65.6	61.8	62.3	5696	65.0
1990	3388.4	666	59.4	65.3	59.4	65.2	58.1	62.1	5200	59.4
1991	1332.0	666	50.0	64.4	50.0	64.4	22.8	59.9	2155	24.6
1992	3428.2	666	67.2	64.6	67.2	64.5	58.6	59.8	5896	67.1
1993	5657.3	666	96.1	66.1	96.1	66.1	97.0	61.7	8421	96.1
1994	4924.9	666	85.8	67.1	85.8	67.0	84.4	62.7	7513	85.8
1995	5219.0	666	89.6	68.1	89.6	68.0	89.5	64.0	7846	89.6



1996	5750.8	673	96.7	69.4	96.7	69.3	97.3	65.4	8490	96.7
1997	5252.4	693	87.0	70.1	87.0	70.1	86.5	66.3	7570	86.4
1998	5408.3	693	89.8	70.9	89.0	70.9	89.1	67.3	7757	88.6
1999	6112.3	693	99.1	72.1	99.1	72.0	100.7	68.6	8684	99.1
2000	5684.4	693	92.5	72.8	92.5	72.8	93.4	69.6	8122	92.5
2001	5526.0	693	90.5	73.5	90.5	73.4	91.0	70.4	7923	90.4
2002	6215.4	693	100.0	74.4	100.0	74.4	102.4	71.5	8760	100.0
2003	5445.6	693	90.6	75.0	90.6	74.9	89.7	72.1	7930	90.5
2004	4734.0	693	79.0	75.1	79.0	75.1	77.8	72.3	6934	78.9
2005	5798.9	693	96.4	75.8	95.5	75.7	95.5	73.0	8362	95.5
2006	5581.9	693	90.3	76.3	90.3	76.2	91.9	73.6	7905	90.2
2007	6078.1	693	83.6	76.5	83.6	76.4	100.1	74.4	7320	83.6
2008	6139.5	693	99.8	77.2	98.1	77.0	100.9	75.2	8617	98.1
2009	5249.3	693	85.1	77.4	85.1	77.3	86.5	75.5	7451	85.1
2010	5358.1	693	86.7	77.6	86.7	77.5	88.3	75.9	7594	86.7
2011	5822.9	693	94.7	78.1	94.7	78.0	95.9	76.4	8291	94.6
2012	2477.4	802	49.5	77.3	49.5	77.2	38.7	75.4	4121	46.9
2013	6239.4	802	90.7	77.7	90.7	77.6	88.8	75.8	7945	90.7
2014	5900.8	802	88.2	78.0	88.2	77.9	84.0	76.0	7726	88.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					416	
C. Inspection, maintenance or repair combined with refuelling	973			908		
D. Inspection, maintenance or repair without refuelling				276		
E. Testing of plant systems or components				7	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				2		
J. Grid limitation, failure or grid unavailability						3
L. Human factor related		60		19	3	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						64
P. Fire					2	
Z. Other				163	15	
Subtotal	973	60	0	1375	437	67
Total	1033			1879		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		42
13. Reactor Auxiliary Systems		47
14. Safety Systems		17
15. Reactor Cooling Systems		82
16. Steam generation systems		22
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		41
32. Feedwater and Main Steam System		33
33. Circulating Water System		2
35. All other I&C Systems		1
41. Main Generator Systems		66
42. Electrical Power Supply Systems		11
XX. Miscellaneous Systems		44
Total	0	409

# US-251 TURKEY POINT-4

Operator: FPL (Florida Power &amp; Light Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 802.0 MW(e)  
 Design Net Capacity: 693.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 6149.8 GW(e)·h  
 Energy Availability Factor: 89.4%  
 Load Factor: 87.5%  
 Operating Factor: 89.4%  
 Energy Unavailability Factor: 10.6%  
 Total Off-line Time: 932 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	621.1	549.3	608.0	584.3	501.3	568.2	564.5	540.6	383.5	126.1	574.6	528.5	6149.8
EAF (%)	100.0	100.0	100.0	100.0	87.6	100.0	100.0	100.0	70.0	29.6	98.6	87.9	89.4
UCF (%)	100.0	100.0	100.0	100.0	87.6	100.0	100.0	100.0	70.0	29.6	98.6	87.9	89.4
LF (%)	104.1	101.9	102.0	101.2	84.0	98.4	94.6	90.6	66.4	21.1	99.4	88.6	87.5
OF (%)	100.0	100.0	100.0	100.0	87.6	100.0	100.0	100.0	70.0	29.6	98.6	87.9	89.4
EUUF (%)	0.0	0.0	0.0	0.0	12.4	0.0	0.0	0.0	30.0	70.4	1.4	12.1	10.6
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	70.4	0.0	0.0	8.4
UCLF (%)	0.0	0.0	0.0	0.0	12.4	0.0	0.0	0.0	0.0	0.0	1.4	12.2	2.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 27 Apr 1967      Lifetime Generation: 187401.4 GW(e)·h  
 Date of First Criticality: 11 Jun 1973      Cumulative Energy Availability Factor: 78.1%  
 Date of Grid Connection: 21 Jun 1973      Cumulative Load Factor: 75.9%  
 Date of Commercial Operation: 07 Sep 1973      Cumulative Unit Capability Factor: 78.2%  
    Cumulative Energy Unavailability Factor: 21.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1973			Data not provided							
1974	4513.4	728	100.0	100.0	100.0	100.0	70.8	70.8	6759	77.2
1975	3991.9	666	68.3	84.9	68.3	84.9	68.4	69.7	6172	70.5
1976	3774.8	666	64.3	78.2	64.3	78.2	64.5	68.0	5825	66.3
1977	3671.0	666	62.7	74.4	62.7	74.4	62.9	66.8	5578	63.7
1978	3791.4	666	65.0	72.6	65.0	72.6	65.0	66.4	6693	76.4
1979	3846.6	666	65.9	71.5	65.9	71.5	65.9	66.3	6361	72.6
1980	3856.5	657	69.4	71.2	69.4	71.2	66.8	66.4	6093	69.4
1981	4507.2	646	77.3	71.9	77.3	71.9	79.6	68.0	6801	77.6
1982	3847.2	646	66.3	71.3	66.3	71.3	68.0	68.0	5806	66.3
1983	2978.9	659	52.4	69.5	52.4	69.5	51.6	66.4	4568	52.1
1984	3084.1	666	54.4	68.1	54.4	68.1	52.7	65.1	4774	54.3
1985	5177.9	666	89.8	69.9	89.7	69.9	88.8	67.1	7852	89.6
1986	1744.0	666	31.9	67.0	31.9	67.0	29.9	64.2	2790	31.8
1987	2657.5	666	49.3	65.7	49.3	65.7	45.6	62.9	4314	49.2
1988	3267.7	666	56.8	65.1	56.8	65.1	55.9	62.4	4986	56.8
1989	2107.6	666	42.0	63.7	42.0	63.7	36.1	60.8	3676	42.0
1990	4384.9	666	76.4	64.4	76.4	64.4	75.2	61.6	6692	76.4
1991	808.0	666	48.2	63.5	48.2	63.5	13.9	59.0	1335	15.2
1992	4642.3	666	81.3	64.5	81.3	64.5	79.4	60.1	7139	81.3
1993	4746.3	666	83.1	65.4	83.1	65.4	81.4	61.1	7277	83.1
1994	4844.4	666	85.0	66.3	85.0	66.3	83.0	62.2	7437	84.9
1995	5780.1	666	98.5	67.8	98.5	67.8	99.1	63.8	8629	98.5
1996	5165.4	673	88.6	68.7	88.6	68.7	87.4	64.9	7771	88.5

1997	5442.6	693	89.6	69.6	89.6	69.6	89.7	65.9	7809	89.1
1998	6181.5	693	100.0	70.9	100.0	70.9	101.8	67.4	8760	100.0
1999	5735.3	693	93.4	71.8	93.4	71.8	94.5	68.5	8185	93.4
2000	5591.4	693	91.4	72.5	91.4	72.5	91.9	69.4	8028	91.4
2001	6105.3	693	98.4	73.5	98.4	73.5	100.6	70.6	8623	98.4
2002	5854.1	693	95.6	74.3	95.6	74.3	96.4	71.5	8369	95.5
2003	5562.5	693	91.7	74.9	91.7	74.9	91.6	72.2	8033	91.7
2004	6079.2	693	98.6	75.7	98.6	75.6	99.9	73.1	8662	98.6
2005	4241.0	693	72.4	75.5	71.3	75.5	69.9	73.0	6243	71.3
2006	5383.7	693	87.6	75.9	87.6	75.9	88.7	73.5	7669	87.5
2007	5148.8	693	97.6	76.6	97.6	76.5	84.8	73.8	8552	97.6
2008	5234.9	693	85.2	76.8	84.4	76.8	86.0	74.2	7415	84.4
2009	5435.4	693	89.2	77.2	89.2	77.1	89.5	74.6	7811	89.2
2010	5949.8	693	95.9	77.7	95.9	77.6	98.0	75.3	8397	95.9
2011	5089.9	693	82.2	77.8	82.2	77.8	83.8	75.5	7202	82.2
2012	5235.4	693	84.4	78.0	84.4	77.9	86.0	75.8	7416	84.4
2013	4674.7	802	73.4	77.9	73.4	77.8	68.8	75.6	6156	70.3
2014	6149.8	802	89.4	78.2	89.4	78.1	87.5	75.9	7828	89.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1975 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		192			339	
C. Inspection, maintenance or repair combined with refuelling	739			1233		
D. Inspection, maintenance or repair without refuelling				266	70	
E. Testing of plant systems or components				6	1	
J. Grid limitation, failure or grid unavailability						1
L. Human factor related					11	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						57
Z. Other					1	
Subtotal	739	192	0	1505	422	58
Total		931			1985	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1975 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		19
13. Reactor Auxiliary Systems		3
14. Safety Systems		5
15. Reactor Cooling Systems		87
16. Steam generation systems		92
31. Turbine and auxiliaries	192	53
32. Feedwater and Main Steam System		22
33. Circulating Water System		3
35. All other I&C Systems		2
41. Main Generator Systems		1
42. Electrical Power Supply Systems		42
Total	192	335

# US-271 VERMONT YANKEE

Operator: ENTERGY (Entergy Nuclear Operations, Inc.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 605.0 MW(e)  
 Design Net Capacity: 514.0 MW(e)  
 Design Discharge Burnup: 33760 MW·d/t  
 Status at end of year: Permanent Shutdown

## 2. Production Summary 2014

Net Energy Production: 5084.0 GW(e)·h  
 Energy Availability Factor: 99.3%  
 Load Factor: 96.5%  
 Operating Factor: 99.9%  
 Energy Unavailability Factor: 0.7%  
 Total Off-line Time: 12 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	456.1	402.2	463.1	436.5	461.1	428.7	448.5	450.2	427.2	415.3	373.6	321.6	5084.0
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.4	99.3
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.4	99.3
LF (%)	101.3	98.9	103.0	100.2	102.4	98.4	99.6	100.0	98.1	92.3	85.6	76.4	96.5
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.3	99.9
EUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.6	0.7
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.6	0.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

PERMANENT SHUTDOWN

## 5. Historical Summary

Date of Construction Start: 11 Dec 1967      Lifetime Generation: 163393.7 GW(e)·h  
 Date of First Criticality: 24 Mar 1972      Cumulative Energy Availability Factor: 86.2%  
 Date of Grid Connection: 20 Sep 1972      Cumulative Load Factor: 83.8%  
 Date of Commercial Operation: 30 Nov 1972      Cumulative Unit Capability Factor: 86.2%  
 Date of Shutdown: 29 Dec 2014      Cumulative Energy Unavailability Factor: 13.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1972	291.4	502	100.0	100.0	100.0	100.0	38.7	38.7	963	65.8
1973	1814.5	468	70.3	74.9	70.3	74.9	44.3	43.4	5354	61.1
1974	2482.7	514	55.4	65.5	55.4	65.5	55.1	49.1	6495	74.1
1975	3561.3	504	80.5	70.3	80.5	70.3	80.7	59.2	7689	87.8
1976	3260.2	504	73.5	71.1	73.5	71.1	73.6	62.7	6776	77.1
1977	3537.9	504	79.8	72.8	79.8	72.8	80.1	66.1	7456	85.1
1978	3240.7	504	73.4	72.9	73.4	72.9	73.4	67.3	6649	75.9
1979	3449.0	504	77.4	73.5	77.4	73.5	78.1	68.8	7194	82.1
1980	2978.8	504	73.2	73.5	72.0	73.3	67.3	68.6	6271	71.4
1981	3568.5	504	84.8	74.7	84.8	74.6	80.8	70.0	7407	84.6
1982	4174.3	504	96.7	76.9	96.7	76.8	94.5	72.4	8406	96.0
1983	2874.5	504	69.8	76.3	69.8	76.2	65.1	71.7	6072	69.3
1984	3335.8	504	79.0	76.5	79.0	76.4	75.3	72.0	6933	78.9
1985	2999.4	504	71.8	76.1	71.8	76.0	67.9	71.7	6287	71.8
1986	2058.4	504	48.9	74.2	48.9	74.1	46.6	69.9	4280	48.9
1987	3536.4	504	83.2	74.8	83.2	74.7	80.1	70.6	7288	83.2
1988	4113.8	504	94.9	76.0	94.9	76.0	92.9	72.0	8333	94.9
1989	3606.8	504	84.4	76.5	84.4	76.5	81.7	72.6	7372	84.2
1990	3616.3	504	84.7	77.0	84.7	76.9	81.9	73.1	7392	84.4
1991	4108.3	504	95.1	77.9	93.7	77.8	93.1	74.1	8200	93.6
1992	3734.6	504	87.6	78.4	87.6	78.3	84.4	74.6	7680	87.4
1993	3372.1	504	78.6	78.4	78.6	78.3	76.4	74.7	6860	78.3
1994	4315.6	504	98.2	79.3	98.2	79.2	97.7	75.8	8600	98.2

1995	3858.5	507	86.6	79.6	86.6	79.5	86.8	76.2	7554	86.2
1996	3798.8	510	84.9	79.9	84.9	79.8	84.8	76.6	7422	84.5
1997	4266.9	510	95.6	80.5	95.6	80.4	95.5	77.4	8358	95.4
1998	3358.7	510	76.6	80.3	76.6	80.2	75.2	77.3	6690	76.4
1999	4059.1	510	90.5	80.7	90.5	80.6	90.9	77.8	7936	90.6
2000	4548.1	510	99.5	81.4	99.5	81.3	101.5	78.6	8738	99.5
2001	4171.1	510	93.1	81.8	93.1	81.7	93.4	79.1	8145	93.0
2002	3962.6	510	91.0	82.1	91.0	82.0	88.7	79.5	7966	90.9
2003	4444.2	510	98.3	82.6	98.3	82.6	99.5	80.1	8612	98.3
2004	3858.0	510	86.6	82.8	86.6	82.7	86.1	80.3	7599	86.5
2005	4106.4	506	93.8	83.1	93.8	83.0	92.6	80.7	8212	93.7
2006	5106.6	557	100.0	83.6	100.0	83.6	104.5	81.4	8760	100.0
2007	4703.7	620	92.6	83.9	92.6	83.9	86.6	81.6	8114	92.6
2008	4895.1	620	94.0	84.3	94.0	84.2	89.9	81.9	8253	94.0
2009	5360.6	620	100.0	84.8	100.0	84.7	98.7	82.4	8760	100.0
2010	4782.5	620	90.7	85.0	90.7	84.9	88.1	82.6	7946	90.7
2011	4924.2	620	93.1	85.2	93.1	85.2	90.7	82.9	8152	93.1
2012	5016.3	605	100.0	85.6	100.0	85.6	94.4	83.2	8784	100.0
2013	4866.0	605	92.7	85.8	92.7	85.8	91.8	83.4	8123	92.7
2014	5084.0	605	99.3	86.2	99.3	86.2	96.5	83.8	8700	99.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1972 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					212	
C. Inspection, maintenance or repair combined with refuelling	59			817		
D. Inspection, maintenance or repair without refuelling				98		
E. Testing of plant systems or components				5	9	
H. Nuclear regulatory requirements					5	
L. Human factor related					6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				0		
Z. Other				18		
Subtotal	59	0	0	938	232	4
Total	59			1174		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1972 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		14
14. Safety Systems		40
15. Reactor Cooling Systems		35
31. Turbine and auxiliaries		35
32. Feedwater and Main Steam System		18
42. Electrical Power Supply Systems		53
XX. Miscellaneous Systems		1
Total	0	208

**US-424 VOGTLE-1****Operator:** SOUTHERN (Southern Nuclear Operating Company, Inc.)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power (RUP)**

**at the beginning of 2014:** 1150.0 MW(e)

**Design Net Capacity:** 1122.0 MW(e)

**Design Discharge Burnup:** 36400 MW·d/t

**Status at end of year:** Operational

**2. Production Summary 2014**

**Net Energy Production:** 8820.2 GW(e)·h

**Energy Availability Factor:** 88.5%

**Load Factor:** 87.6%

**Operating Factor:** 88.5%

**Energy Unavailability Factor:** 11.5%

**Total Off-line Time:** 1008 hours

**3. 2014 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	878.9	793.2	418.6	288.0	865.6	832.3	735.2	717.1	761.3	801.1	850.6	878.3	8820.2
<b>EAF (%)</b>	100.0	100.0	48.9	49.3	100.0	100.0	85.8	88.0	96.4	94.4	100.0	100.0	88.5
<b>UCF (%)</b>	100.0	100.0	48.9	49.3	100.0	100.0	85.8	88.0	96.4	94.4	100.0	100.0	88.5
<b>LF (%)</b>	102.7	102.6	49.0	34.8	101.2	100.5	85.9	83.8	92.0	93.6	102.6	102.7	87.6
<b>OF (%)</b>	100.0	100.0	48.9	49.3	100.0	100.0	85.8	88.0	96.4	94.4	100.0	100.0	88.5
<b>EUf (%)</b>	0.0	0.0	51.1	50.7	0.0	0.0	14.2	12.0	3.6	5.6	0.0	0.0	11.5
<b>PUf (%)</b>	0.0	0.0	51.1	37.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4
<b>UCLF (%)</b>	0.0	0.0	0.0	13.7	0.0	0.0	14.2	12.0	3.6	5.6	0.0	0.0	4.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2014 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 01 Aug 1976      **Lifetime Generation:** 244526.3 GW(e)·h

**Date of First Criticality:** 09 Mar 1987      **Cumulative Energy Availability Factor:** 90.6%

**Date of Grid Connection:** 27 Mar 1987      **Cumulative Load Factor:** 90.8%

**Date of Commercial Operation:** 01 Jun 1987      **Cumulative Unit Capability Factor:** 90.7%

**Cumulative Energy Unavailability Factor:** 9.4%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1987			Data not provided							
1988	6799.7	1079	74.2	74.2	74.2	74.2	71.7	71.7	6569	74.8
1989	8709.4	1083	94.2	84.2	94.2	84.2	91.8	81.8	8275	94.5
1990	7353.1	1079	78.4	82.3	78.4	82.3	77.8	80.5	6980	79.7
1991	7501.7	1100	78.9	81.4	78.9	81.4	77.9	79.8	7016	80.1
1992	9383.5	1105	96.9	84.6	96.9	84.6	96.7	83.2	8523	97.0
1993	8600.7	1145	86.3	84.9	86.3	84.9	85.7	83.7	7577	86.5
1994	8817.2	1168	89.6	85.6	89.6	85.6	86.1	84.0	7847	89.6
1995	9984.0	1162	99.2	87.4	98.4	87.3	98.1	85.9	8621	98.4
1996	8149.8	1162	81.5	86.7	81.5	86.6	79.8	85.2	7162	81.5
1997	8270.1	1162	81.9	86.2	81.9	86.1	81.2	84.8	7167	81.8
1998	10216.9	1162	99.8	87.5	99.8	87.4	100.4	86.2	8738	99.7
1999	9425.9	1152	92.6	87.9	92.6	87.8	93.3	86.8	8108	92.6
2000	9196.6	1148	90.7	88.1	90.7	88.1	91.2	87.2	7963	90.7
2001	10144.4	1148	98.9	88.9	98.9	88.8	100.9	88.2	8665	98.9
2002	8638.8	1148	85.3	88.6	85.3	88.6	85.9	88.0	7469	85.3
2003	9411.5	1152	92.5	88.9	92.5	88.8	93.3	88.3	8097	92.4
2004	10162.3	1152	99.0	89.5	99.0	89.5	100.4	89.1	8694	99.0
2005	9220.1	1152	90.9	89.6	90.9	89.5	91.4	89.2	7964	90.9
2006	8671.1	1152	86.0	89.4	86.0	89.3	85.9	89.0	7536	86.0
2007	9960.3	1109	100.0	89.9	100.0	89.9	102.5	89.7	8760	100.0
2008	9050.4	1109	89.1	89.9	89.1	89.8	92.9	89.8	7828	89.1
2009	9135.0	1150	90.1	89.9	90.1	89.8	90.7	89.9	7861	89.7
2010	10247.4	1150	100.0	90.3	100.0	90.3	101.7	90.4	8760	100.0

2011	9216.9	1150	90.8	90.3	90.8	90.3	91.5	90.4	7954	90.8
2012	9217.0	1150	90.7	90.4	90.7	90.3	91.2	90.5	7961	90.6
2013	10222.4	1150	100.0	90.7	100.0	90.7	101.5	90.9	8760	100.0
2014	8820.2	1150	88.5	90.7	88.5	90.6	87.6	90.8	7752	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1988 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		360			120	
C. Inspection, maintenance or repair combined with refuelling	647			610		
D. Inspection, maintenance or repair without refuelling				21		
E. Testing of plant systems or components				2		
H. Nuclear regulatory requirements					7	
L. Human factor related					11	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Other				1	0	2
Subtotal	647	360	0	634	138	3
Total		1007			775	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1988 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		7
14. Safety Systems		21
15. Reactor Cooling Systems	29	27
16. Steam generation systems		4
17. Safety I&C Systems (excluding reactor I&C)		8
31. Turbine and auxiliaries	69	2
32. Feedwater and Main Steam System	152	17
35. All other I&C Systems		2
41. Main Generator Systems	109	18
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems		0
Total	359	115

## US-425 VOGTLE-2

**Operator:** SOUTHERN (Southern Nuclear Operating Company, Inc.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power (RUP)**  
**at the beginning of 2014:** 1152.0 MW(e)  
**Design Net Capacity:** 1101.0 MW(e)  
**Design Discharge Burnup:** 36400 MW·d/t  
**Status at end of year:** Operational

### 2. Production Summary 2014

**Net Energy Production:** 9276.5 GW(e)·h  
**Energy Availability Factor:** 91.1%  
**Load Factor:** 91.9%  
**Operating Factor:** 91.1%  
**Energy Unavailability Factor:** 8.9%  
**Total Off-line Time:** 776 hours

### 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e)·h</b>	887.3	780.7	876.3	770.0	868.7	832.8	830.4	860.2	364.3	463.9	857.1	884.8	9276.5
<b>EAF (%)</b>	100.0	100.0	100.0	93.6	100.0	100.0	100.0	100.0	44.8	55.2	100.0	100.0	91.1
<b>UCF (%)</b>	100.0	100.0	100.0	93.6	100.0	100.0	100.0	100.0	44.8	55.2	100.0	100.0	91.1
<b>LF (%)</b>	103.5	100.8	102.4	92.8	101.4	100.4	96.9	100.4	43.9	54.1	103.2	103.2	91.9
<b>OF (%)</b>	100.0	100.0	100.0	93.6	100.0	100.0	100.0	100.0	44.9	55.2	100.0	100.0	91.1
<b>EUF (%)</b>	0.0	0.0	0.0	6.4	0.0	0.0	0.0	0.0	55.2	44.8	0.0	0.0	8.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.2	44.8	0.0	0.0	8.3
<b>UCLF (%)</b>	0.0	0.0	0.0	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2014 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1976  
**Date of First Criticality:** 28 Mar 1989  
**Date of Grid Connection:** 10 Apr 1989  
**Date of Commercial Operation:** 20 May 1989

**Lifetime Generation:** 232596.7 GW(e)·h  
**Cumulative Energy Availability Factor:** 90.8%  
**Cumulative Load Factor:** 90.5%  
**Cumulative Unit Capability Factor:** 90.8%  
**Cumulative Energy Unavailability Factor:** 9.2%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1989	5547.2	1110	93.8	93.8	93.8	93.8	94.4	94.4	5104	94.1
1990	6868.0	1110	81.1	85.9	81.1	85.9	70.6	79.6	7125	81.3
1991	8897.4	1097	95.4	89.5	95.4	89.5	92.6	84.5	8375	95.6
1992	7779.6	1109	80.8	87.1	80.8	87.1	79.9	83.2	7175	81.7
1993	8680.9	1140	88.1	87.3	88.1	87.3	86.9	84.0	7737	88.3
1994	9331.6	1168	92.1	88.2	92.1	88.2	91.2	85.4	8062	92.0
1995	9165.6	1162	90.8	88.6	90.3	88.5	90.0	86.1	7908	90.3
1996	9037.6	1162	89.9	88.8	89.9	88.7	88.5	86.4	7899	89.9
1997	10310.8	1162	100.0	90.1	100.0	90.1	101.3	88.2	8760	100.0
1998	8388.6	1162	83.9	89.5	83.9	89.4	82.4	87.6	7347	83.9
1999	9022.6	1156	89.5	89.5	89.5	89.4	89.1	87.7	7833	89.4
2000	10337.8	1149	100.0	90.4	100.0	90.3	102.4	89.0	8784	100.0
2001	9456.7	1149	92.6	90.5	92.6	90.5	94.0	89.4	8112	92.6
2002	8418.9	1149	83.7	90.0	83.7	90.0	83.6	89.0	7328	83.7
2003	9736.6	1149	95.9	90.4	95.9	90.4	96.7	89.5	8401	95.9
2004	9168.7	1149	90.8	90.5	90.8	90.4	90.8	89.6	7970	90.7
2005	8592.9	1149	85.2	90.2	85.2	90.1	85.4	89.3	7464	85.2
2006	9276.1	1149	91.7	90.2	91.7	90.2	92.2	89.5	8024	91.6
2007	8347.3	1127	83.3	89.9	83.3	89.8	84.6	89.2	7323	83.6
2008	8727.1	1127	88.4	89.8	88.4	89.8	88.2	89.2	7767	88.4
2009	10150.9	1152	99.5	90.3	99.5	90.2	100.6	89.7	8710	99.4
2010	9363.1	1152	91.5	90.3	91.5	90.3	92.8	89.9	8011	91.4
2011	9512.4	1152	93.2	90.5	93.2	90.4	94.3	90.1	8163	93.2
2012	10341.2	1152	100.0	90.9	100.0	90.8	102.2	90.6	8784	100.0



2013	8860.3	1152	88.5	90.8	88.5	90.7	87.8	90.5	7748	88.4
2014	9276.5	1152	91.1	90.8	91.1	90.8	91.9	90.5	7984	91.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1989 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		46			111	
C. Inspection, maintenance or repair combined with refuelling	730			549		
D. Inspection, maintenance or repair without refuelling				59		
E. Testing of plant systems or components				1		
L. Human factor related					27	
Z. Other				2	8	1
Subtotal	730	46	0	611	146	1
Total		776			758	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1989 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		9
14. Safety Systems		11
15. Reactor Cooling Systems		28
16. Steam generation systems		1
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System	46	22
35. All other I&C Systems		6
41. Main Generator Systems		16
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		2
Total	46	107

# US-382 WATERFORD-3

Operator: ENTERGY (Entergy Nuclear Operations, Inc.)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1168.0 MW(e)  
 Design Net Capacity: 1104.0 MW(e)  
 Design Discharge Burnup: 33450 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 9166.3 GW(e)·h  
 Energy Availability Factor: 91.3%  
 Load Factor: 89.6%  
 Operating Factor: 91.3%  
 Energy Unavailability Factor: 8.7%  
 Total Off-line Time: 761 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	874.1	787.8	873.3	336.3	303.1	840.8	864.5	862.1	832.0	867.6	848.0	876.6	9166.3
EAF (%)	100.0	100.0	100.0	40.0	55.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.3
UCF (%)	100.0	100.0	100.0	40.0	55.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.3
LF (%)	100.6	100.4	100.6	40.0	34.9	100.0	99.5	99.2	98.9	99.8	100.7	100.9	89.6
OF (%)	100.0	100.0	100.0	40.0	55.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.3
EUf (%)	0.0	0.0	0.0	60.0	44.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7
PUf (%)	0.0	0.0	0.0	60.0	44.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 14 Nov 1974      Lifetime Generation: 247489.4 GW(e)·h  
 Date of First Criticality: 04 Mar 1985      Cumulative Energy Availability Factor: 87.4%  
 Date of Grid Connection: 18 Mar 1985      Cumulative Load Factor: 87.0%  
 Date of Commercial Operation: 24 Sep 1985      Cumulative Unit Capability Factor: 87.7%  
    Cumulative Energy Unavailability Factor: 12.6%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	1805.2	1099	76.1	76.1	76.1	76.1	68.8	68.8	1800	75.7
1986	7308.4	1096	79.5	78.7	79.5	78.7	76.1	74.5	6921	79.0
1987	7434.1	1075	80.9	79.7	80.9	79.7	78.9	76.4	7085	80.9
1988	6548.4	1075	73.7	77.9	73.7	77.9	69.3	74.3	6468	73.6
1989	7609.4	1075	81.5	78.7	81.5	78.7	80.8	75.8	7136	81.5
1990	8604.2	1075	92.2	81.3	92.2	81.3	91.4	78.7	8079	92.2
1991	7274.9	1075	78.9	80.9	78.5	80.8	77.3	78.5	6869	78.4
1992	7622.2	1075	82.1	81.1	82.1	81.0	80.7	78.8	7213	82.1
1993	9138.8	1075	99.2	83.3	99.2	83.2	97.0	81.0	8691	99.2
1994	7931.9	1075	86.3	83.6	86.3	83.5	84.2	81.3	7555	86.2
1995	7763.4	1075	82.7	83.5	82.7	83.4	82.4	81.5	7241	82.7
1996	8926.8	1075	93.8	84.4	93.8	84.4	94.5	82.6	8237	93.8
1997	6720.7	1075	70.4	83.3	70.4	83.2	71.4	81.7	6161	70.3
1998	8620.8	1075	91.0	83.8	91.0	83.8	91.5	82.4	7966	90.9
1999	7441.7	1075	78.9	83.5	78.9	83.5	79.0	82.2	6905	78.8
2000	8477.4	1075	88.2	83.8	88.2	83.8	89.8	82.7	7743	88.1
2001	9539.1	1075	99.5	84.8	99.5	84.7	101.3	83.8	8718	99.5
2002	8847.9	1075	92.8	85.2	92.8	85.2	94.0	84.4	8136	92.9
2003	8503.1	1075	89.7	85.5	89.7	85.4	90.3	84.7	7865	89.8
2004	9654.4	1075	99.9	86.2	99.9	86.2	102.2	85.7	8771	99.9
2005	7913.7	1089	84.0	86.1	79.7	85.9	82.9	85.5	6975	79.6
2006	9279.8	1158	91.3	86.4	91.3	86.1	91.5	85.8	7996	91.3
2007	9893.0	1157	96.2	86.8	96.2	86.6	97.6	86.4	8423	96.2
2008	9054.0	1157	90.3	87.0	87.7	86.7	89.1	86.5	7703	87.7

2009	8956.1	1176	87.5	87.0	87.5	86.7	86.9	86.5	7648	87.3
2010	10276.2	1168	100.0	87.6	100.0	87.3	100.4	87.1	8760	100.0
2011	8942.4	1168	89.9	87.7	89.9	87.4	87.4	87.1	7876	89.9
2012	7880.3	1168	79.2	87.3	77.7	87.0	76.8	86.7	6820	77.6
2013	9386.9	1168	93.3	87.6	93.3	87.2	91.7	86.9	8176	93.3
2014	9166.3	1168	91.3	87.7	91.3	87.4	89.6	87.0	7999	91.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1985 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					194	
C. Inspection, maintenance or repair combined with refuelling	760			732		
D. Inspection, maintenance or repair without refuelling				90		
E. Testing of plant systems or components				0		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					10	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						28
Z. Other					2	
Subtotal	760	0	0	822	206	28
Total	760			1056		

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1985 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		3
14. Safety Systems		2
15. Reactor Cooling Systems		72
17. Safety I&C Systems (excluding reactor I&C)		26
31. Turbine and auxiliaries		35
32. Feedwater and Main Steam System		20
33. Circulating Water System		2
35. All other I&C Systems		15
41. Main Generator Systems		2
42. Electrical Power Supply Systems		2
XX. Miscellaneous Systems		3
Total	0	189

# US-390 WATTS BAR-1

Operator: TVA (Tennessee Valley Authority)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1123.0 MW(e)  
 Design Net Capacity: 1218.0 MW(e)  
 Design Discharge Burnup: 36000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8789.7 GW(e)·h  
 Energy Availability Factor: 88.7%  
 Load Factor: 89.3%  
 Operating Factor: 88.7%  
 Energy Unavailability Factor: 11.3%  
 Total Off-line Time: 991 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	872.9	785.1	633.3	0.0	738.2	810.2	754.2	830.4	809.4	848.7	838.8	868.5	8789.7
EAF (%)	100.0	100.0	74.2	0.0	94.8	100.0	94.7	100.0	100.0	100.0	100.0	100.0	88.7
UCF (%)	100.0	100.0	74.2	0.0	94.8	100.0	94.7	100.0	100.0	100.0	100.0	100.0	88.7
LF (%)	104.5	104.0	75.9	0.0	88.4	100.2	90.3	99.4	100.1	101.6	103.6	103.9	89.3
OF (%)	100.0	100.0	74.2	0.0	94.8	100.0	94.6	100.0	100.0	100.0	100.0	100.0	88.7
EUf (%)	0.0	0.0	25.8	100.0	5.2	0.0	5.3	0.0	0.0	0.0	0.0	0.0	11.3
PUf (%)	0.0	0.0	25.8	100.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 23 Jan 1973      Lifetime Generation: 165407.9 GW(e)·h  
 Date of First Criticality: 01 Jan 1996      Cumulative Energy Availability Factor: 90.1%  
 Date of Grid Connection: 06 Feb 1996      Cumulative Load Factor: 90.3%  
 Date of Commercial Operation: 27 May 1996      Cumulative Unit Capability Factor: 90.1%  
    Cumulative Energy Unavailability Factor: 9.9%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1996	5141.4	1109	87.7	87.7	87.7	87.7	89.0	89.0	4803	91.4
1997	7600.1	1117	82.3	84.3	82.3	84.3	77.7	81.9	7269	83.0
1998	9681.0	1117	99.0	90.0	99.0	90.0	98.9	88.5	8672	99.0
1999	8267.4	1118	86.8	89.1	86.8	89.1	84.4	87.3	7606	86.8
2000	9076.4	1118	92.5	89.8	92.5	89.8	92.4	88.4	8124	92.5
2001	9626.6	1125	96.1	91.0	96.1	91.0	97.5	90.1	8419	96.1
2002	9079.4	1125	91.3	91.0	91.3	91.0	92.1	90.4	7998	91.3
2003	8549.6	1121	86.2	90.4	86.2	90.4	86.9	89.9	7551	86.2
2004	9856.9	1121	98.8	91.4	98.8	91.4	100.1	91.1	8680	98.8
2005	8816.4	1121	89.5	91.2	89.5	91.2	89.8	91.0	7841	89.5
2006	6697.1	1121	69.7	89.1	69.7	89.1	68.2	88.8	6099	69.6
2007	10049.7	1123	100.0	90.1	100.0	90.1	102.2	90.0	8760	100.0
2008	8112.3	1123	82.5	89.5	82.5	89.5	82.2	89.4	7247	82.5
2009	9207.5	1123	92.0	89.7	92.0	89.7	93.6	89.7	8055	92.0
2010	9738.5	1123	97.5	90.2	97.5	90.2	99.0	90.3	8544	97.5
2011	8231.0	1123	84.3	89.8	84.3	89.8	83.7	89.9	7386	84.3
2012	8516.5	1123	86.0	89.6	86.0	89.6	86.3	89.7	7557	86.0
2013	9967.8	1123	100.0	90.2	99.4	90.2	101.3	90.3	8709	99.4
2014	8789.7	1123	88.7	90.1	88.7	90.1	89.3	90.3	7769	88.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1996 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External

A. Plant equipment problem/failure		39			178	
C. Inspection, maintenance or repair combined with refuelling	950			591		
D. Inspection, maintenance or repair without refuelling				68		
E. Testing of plant systems or components				37		
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					15	
Z. Other					8	
Subtotal	950	39	0	696	201	2
Total		989			899	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1996 to 2014 Average Hours Lost Per Year
12. Reactor I&C Systems		3
14. Safety Systems		10
15. Reactor Cooling Systems		11
16. Steam generation systems		2
31. Turbine and auxiliaries		52
32. Feedwater and Main Steam System	39	48
33. Circulating Water System		13
35. All other I&C Systems		2
41. Main Generator Systems		18
42. Electrical Power Supply Systems		16
Total	39	175

# US-482 WOLF CREEK

Operator: WCNO (WOLF CREEK NUCLEAR OPERATION CORP.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power (RUP) at the beginning of 2014: 1195.0 MW(e)  
 Design Net Capacity: 1170.0 MW(e)  
 Design Discharge Burnup: 33000 MW·d/t  
 Status at end of year: Operational

## 2. Production Summary 2014

Net Energy Production: 8569.2 GW(e)·h  
 Energy Availability Factor: 81.7%  
 Load Factor: 81.9%  
 Operating Factor: 81.7%  
 Energy Unavailability Factor: 18.3%  
 Total Off-line Time: 1599 hours

## 3. 2014 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e)·h	900.3	816.8	184.5	0.0	495.0	862.5	890.6	885.8	867.6	904.3	852.1	909.7	8569.2
EAF (%)	100.0	100.0	22.6	0.0	59.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.7
UCF (%)	100.0	100.0	22.6	0.0	59.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.7
LF (%)	101.3	101.7	20.8	0.0	55.7	100.2	100.2	99.6	100.8	101.7	98.9	102.3	81.9
OF (%)	100.0	100.0	22.6	0.0	59.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.7
EUf (%)	0.0	0.0	77.4	100.0	40.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.3
PUf (%)	0.0	0.0	77.4	100.0	40.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2014 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 31 May 1977      Lifetime Generation: 252953.4 GW(e)·h  
 Date of First Criticality: 22 May 1985      Cumulative Energy Availability Factor: 85.2%  
 Date of Grid Connection: 12 Jun 1985      Cumulative Load Factor: 84.6%  
 Date of Commercial Operation: 03 Sep 1985      Cumulative Unit Capability Factor: 85.2%  
    Cumulative Energy Unavailability Factor: 14.8%

Year	Energy [GW·h]	RUP [MW]	Performance for Full Years of Commercial Operation							
			Unit Capability Factor [%]		Energy Availability Factor [%]		Load Factor [%]		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	OF [%]
1985	2942.1	1144	100.0	100.0	100.0	100.0	90.6	90.6	2770	96.2
1986	6966.1	1128	73.0	79.7	73.0	79.7	70.5	75.5	6416	73.2
1987	6504.1	1128	68.6	74.9	68.6	74.9	65.8	71.3	6009	68.6
1988	6676.4	1128	66.8	72.5	66.8	72.5	67.4	70.1	5963	67.9
1989	9709.3	1135	98.4	78.5	98.4	78.5	97.7	76.5	8618	98.4
1990	7889.1	1135	79.8	78.7	79.8	78.7	79.3	77.1	7036	80.3
1991	5891.4	1135	71.0	77.5	71.0	77.5	59.3	74.2	6288	71.8
1992	8490.7	1131	85.4	78.6	85.4	78.6	85.5	75.8	7538	85.8
1993	7908.6	1132	79.3	78.7	79.3	78.7	79.7	76.2	7000	79.9
1994	8546.0	1149	85.4	79.4	85.4	79.4	84.9	77.2	7500	85.6
1995	10062.2	1163	98.5	81.3	98.5	81.3	98.7	79.3	8625	98.5
1996	8233.7	1165	81.8	81.3	80.6	81.2	80.4	79.4	7078	80.6
1997	8447.5	1163	82.8	81.5	82.8	81.4	82.9	79.7	7255	82.8
1998	10400.7	1163	100.0	82.9	100.0	82.8	102.1	81.4	8760	100.0
1999	9156.6	1163	89.6	83.3	89.6	83.3	89.9	82.0	7847	89.6
2000	9071.4	1169	88.8	83.7	88.8	83.6	88.3	82.4	7795	88.7
2001	10346.7	1170	99.7	84.7	99.7	84.6	101.0	83.6	8731	99.7
2002	9041.7	1165	87.8	84.9	87.8	84.8	88.4	83.9	7695	87.8
2003	8902.5	1167	86.7	85.0	86.7	84.9	87.1	84.1	7594	86.7
2004	10132.7	1166	98.8	85.7	98.5	85.6	98.9	84.8	8650	98.5
2005	8820.9	1165	86.0	85.7	86.0	85.6	86.4	84.9	7528	85.9
2006	9350.3	1166	90.6	86.0	90.6	85.9	91.5	85.2	7935	90.6
2007	10369.1	1166	100.0	86.6	100.0	86.5	101.5	86.0	8760	100.0
2008	8505.9	1166	82.8	86.4	82.8	86.4	83.0	85.8	7271	82.8

2009	8768.5	1160	86.0	86.4	86.0	86.3	86.3	85.9	7541	86.1
2010	9555.7	1160	93.2	86.7	93.2	86.6	94.0	86.2	8163	93.2
2011	7350.6	1195	72.8	86.1	72.8	86.1	71.1	85.6	6333	72.3
2012	8295.9	1195	79.9	85.9	79.9	85.8	79.0	85.3	7014	79.8
2013	7175.9	1195	70.9	85.4	70.9	85.3	68.5	84.7	6210	70.9
2014	8569.2	1195	81.7	85.2	81.7	85.2	81.9	84.6	7161	81.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2014 Hours Lost			1986 to 2014 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					229	
C. Inspection, maintenance or repair combined with refuelling				886	11	
D. Inspection, maintenance or repair without refuelling	1599			7		
E. Testing of plant systems or components				0	1	
H. Nuclear regulatory requirements					2	
J. Grid limitation, failure or grid unavailability						4
L. Human factor related					95	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
Z. Other					7	
Subtotal	1599	0	0	893	345	8
Total		1599			1246	

## 7. Equipment Related Full Outages, Analysis by System

System	2014 Hours Lost	1986 to 2014 Average Hours Lost Per Year
11. Reactor and Accessories		23
12. Reactor I&C Systems		10
15. Reactor Cooling Systems		1
16. Steam generation systems		34
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		56
35. All other I&C Systems		7
41. Main Generator Systems		70
42. Electrical Power Supply Systems		3
XX. Miscellaneous Systems		12
Total	0	225

## 6. NON-ELECTRICAL APPLICATION OF NUCLEAR ENERGY IN MEMBER STATES

Table 6.1: District heating and process heat in 2014

Country	Reactor	District heating [Gcal]	Process heat [Gcal]	Total heat [Gcal]
Bulgaria	Kozloduy-5	60517	NA	60517
	Kozloduy-6	12780	NA	12780
Czech Republic	Temelin-1	77055	NA	77055
	Temelin-2	39632	NA	39632
Hungary	Paks-2	1416	NA	1416
	Paks-3	3251	NA	3251
	Paks-4	34013	NA	34013
India	Rajasthan-1	NA	0	0
	Rajasthan-2	NA	87024	87024
	Rajasthan-3	NA	10668	10668
	Rajasthan-4	NA	2339	2339
Romania	Cernavoda-1	34361	NA	34361
	Cernavoda-2	39071	NA	39071
Russia	Balakovo-1	20645	0	20645
	Balakovo-2	4781	0	4781
	Balakovo-3	15079	0	15079
	Balakovo-4	16344	0	16344
	Beloyarsky-3	279617	0	279617
	Bilibino-1	27771	NA	27771
	Bilibino-2	46161	NA	46161
	Bilibino-3	41773	NA	41773
	Bilibino-4	52686	NA	52686
	Kalinin-1	68920	0	68920
	Kalinin-2	177346	0	177346
	Kalinin-3	NA	102961	102961
	Kola-1	5865	270	6135
	Kola-2	5687	269	5956
	Kola-3	6114	250	6364
	Kola-4	4052	289	4341
	Kursk-1	59645	2717	62362
	Kursk-2	68349	5149	73498
	Kursk-3	149432	8240	157672
	Kursk-4	159804	7731	167535
	Leningrad-1	204699	87436	292135
	Leningrad-2	101479	36676	138155
	Leningrad-3	200522	117596	318118
	Leningrad-4	205527	122206	327733
	Novovoronezh-3	212682	0	212682
	Novovoronezh-4	64619	0	64619
	Novovoronezh-5	14030	6201	20231
	Smolensk-1	155554	15093	170647
	Smolensk-2	137761	3141	140902
	Smolensk-3	179996	18047	198043
Slovakia	Bohunice-3	177807	0	177807
	Bohunice-4	195618	0	195618



Switzerland	Bezau-1	126722	NA	126722
	Bezau-2	13686	NA	13686
	Goesgen	NA	50857	50857
Ukraine	Khemlnitski-1	80096	NA	80096
	Khemlnitski-2	196385	NA	196385
	Rovno-1	33615	NA	33615
	Rovno-2	33284	NA	33284
	Rovno-3	145267	NA	145267
	Rovno-4	122477	NA	122477
	South Ukraine-1	117953	NA	117953
	South Ukraine-2	115232	NA	115232
	South Ukraine-3	143705	NA	143705
	Zaporozhe-1	64908	NA	64908
	Zaporozhe-2	69817	NA	69817
	Zaporozhe-3	59272	NA	59272
	Zaporozhe-4	109711	NA	109711
	Zaporozhe-5	110815	NA	110815
	Zaporozhe-6	134143	NA	134143

Table 6.2: Water desalination in 2014

Country	Reactor	Thermal energy [Gcal]	Electrical energy for reverse osmosis [MWh]	Water produced [m3]
India	Madras-1	33200	NA	
	Madras-2	0	NA	0
Japan	Genkai-3	0	NA	0
	Genkai-4	0	NA	0
	Ikata 1&2	0	NA	0
	Ikata-3	0	NA	0
	Ohi 1&2	0	NA	0
	Takahama 3&4	0	NA	0
Pakistan	KANUPP	0	NA	0

AR-1

ATUCHA-1

ARGENTINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 22-NiMoCr-37
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: 5 CrNiNb 19-9
Reactor vessel overall length/height [m]	: 12
Inside shell diameter [m]	: 5.36
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zry-4
Average fuel enrichment [% of U235]	: 0.85
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 11140
Active core diameter [m]	: 4.51
Active core height/length [m]	: 5.3
Number of fissile fuel assemblies/bundles	: 250
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 38.8
Moderator weight [t]	: <Not Available>
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.55
Average core power density [kW/dm <sup>3</sup> ]	: 13.74
Average fuel power density [kW/kgU]	: 30.56
Fuel linear heat generation rate [kW/m]	: 23.22

#### Reactivity control

Control rod material	: <Not Available>
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: <Not Available>
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: <Not Available>

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 293.4
Operating coolant pressure [MPa]	: 11.5
Reactor outlet temperature [°C]	: 303.3
Reactor inlet temperature [°C]	: 264
Coolant mass flow at the rated power [t/h]	: 21000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 534.7
Design heat transfer surface [m2]	: 3454

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.5
Design pressure difference [MPa]	: <Not Available>

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 3
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 1980

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Steel
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>

Total containment volume [m3]	: <Not Available>
Number of containment spray pumps	: <Not Available>
Containment design pressure [MPa]	: 0.28
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: <Not Available>

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 1
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: <Not Available>
LPSI system pressure [MPa]	: <Not Available>
HPSI system flowrate [t/h]	: <Not Available>
LPSI system flowrate [t/h]	: <Not Available>

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: <Not Available>
Number of IP cylinders per turbine	: <Not Available>
Number of LP cylinders per turbine	: <Not Available>
HP cylinder inlet steam pressure [MPa]	: 4.26
HP cylinder Inlet steam moisture [%]	: <Not Available>
HP cylinder inlet steam temperature [°C]	: 254
HP cylinder Inlet steam flow rate [t/h]	: 1856

### Main generator

Rated active power [MWe]	: 357
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: <Not Available>
Output frequency [Hz]	: <Not Available>

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: <Not Available>

Number of main condensate pumps	: <Not Available>
Number of main condensate pumps required for full power	: <Not Available>
Condenser vacuum at the full power (absolute pressure) [kPa]	: <Not Available>

#### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 2
Number of feedwater pumps required for full power operation	: <Not Available>
Feedwater discharge pressure [MPa]	: <Not Available>
Steam generator feedwater inlet temperature [°C]	: <Not Available>

#### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

#### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	: <Not Available>
Cable segregation within the unit used for	: <Not Available>
On-site fire brigade	: <Not Available>
Off-site fire brigade response time	: <Not Available>

#### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: <Not Available>
Number of on site non-safety related gas turbines	: <Not Available>
Other on-site emergency AC power sources	: 3
Estimated time reserve of the batteries at full load [h]	: <Not Available>
Total installed capacity of the on-site emergency power sources per unit [MW]	: <Not Available>
Total battery capacity [Ah]	: <Not Available>

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 10120
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Available>

#### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 304 L-SS-CALANDRIA
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 6.3
Inside shell diameter [m]	: 0.104
Shell thickness [mm]	: 43.4
Number of pressure channels	:
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	:

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: <Not Available>
Part of the core refuelled [%]	:
Average discharge burnup [MWd/t]	: 7190
Active core diameter [m]	: 6.28
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 85.73
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 10.8
Average fuel power density [kW/kgU]	: 23.2
Fuel linear heat generation rate [kW/m]	: 24.75

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: B/GD
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	:
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 10.2
Reactor outlet temperature [°C]	: 312
Reactor inlet temperature [°C]	: 266
Coolant mass flow at the rated power [t/h]	: 8800

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:



Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.125
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.62
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 253
HP cylinder Inlet steam flow rate [t/h]	: 3600

### Main generator

Rated active power [MWe]	: 648
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

AM-19

ARMENIAN-2

ARMENIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	:
Average discharge burnup [MWd/t]	: 28600
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 83
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron Carbide
Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 295.8
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	:
Number of containment spray pumps	:
Containment design pressure [MPa]	:
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 6
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 13.0
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	: 45
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	: 1338

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: 259
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 2
Condenser tube material	: Stainles Steel

Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.2

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 5
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 6.6
Steam generator feedwater inlet temperature [°C]	: 223

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 4
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 4
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 8.4
Total battery capacity [Ah]	: 1500

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 740
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: 1288

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>



BE-2

DOEL-1

BELGIUM

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SOUDOTENAX-56
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 10.6
Inside shell diameter [m]	: 3.327
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	:
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 2.46
Active core height/length [m]	: 2.44
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 31.7
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 102.6
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 22.22

#### Reactivity control

Control rod material	: <Not Available>
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.73
Reactor outlet temperature [°C]	: 315.08
Reactor inlet temperature [°C]	: 284.7
Coolant mass flow at the rated power [t/h]	: 26120

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 24
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Available>

Total containment volume [m3]	:
Number of containment spray pumps	:
Containment design pressure [MPa]	: 2.9
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 272
HP cylinder Inlet steam flow rate [t/h]	: 2400

### Main generator

Rated active power [MWe]	: 415
Rated apparent power [MVA]	: 500
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: -

Number of main condensate pumps	: -
Number of main condensate pumps required for full power	: -
Condenser vacuum at the full power (absolute pressure) [kPa]	: -

#### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	: -
Feedwater discharge pressure [MPa]	: -
Steam generator feedwater inlet temperature [°C]	: -

#### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

#### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: -
Number of on site non-safety related gas turbines	: -
Other on-site emergency AC power sources	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SOUDOTENAX-56
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 10.6
Inside shell diameter [m]	: 3.32
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 2.46
Active core height/length [m]	: 2.44
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 31.7
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 102.6
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 22.22

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.73
Reactor outlet temperature [°C]	: 315.08
Reactor inlet temperature [°C]	: 284.7
Coolant mass flow at the rated power [t/h]	: 26120

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 24
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 2.9
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 272
HP cylinder Inlet steam flow rate [t/h]	: 2400

### Main generator

Rated active power [MWe]	: 415
Rated apparent power [MVA]	: 500
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA- 508-CL-2
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: <Not Available>
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	:
Average discharge burnup [MWd/t]	: 49000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 69.5
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 115
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 20

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 32

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.73
Reactor outlet temperature [°C]	: 315.08
Reactor inlet temperature [°C]	: 284.7
Coolant mass flow at the rated power [t/h]	: 26120

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 3.5
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 273
HP cylinder Inlet steam flow rate [t/h]	: 1513

### Main generator

Rated active power [MWe]	: 1056
Rated apparent power [MVA]	: 1330
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: 1
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 800

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA- 533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: INOX
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 4.27
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 84.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 96.5
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 16.47

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.73
Reactor outlet temperature [°C]	: 315.08
Reactor inlet temperature [°C]	: 284.7
Coolant mass flow at the rated power [t/h]	: 26120

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 45
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.5
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 7.28
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 288
HP cylinder Inlet steam flow rate [t/h]	: 1667

### Main generator

Rated active power [MWe]	: 1065
Rated apparent power [MVA]	: 1330
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: 1
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 800

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 1.2-MD-07-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.322
Inside shell diameter [m]	: 3.987
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4/M5
Average fuel enrichment [% of U235]	: 4.6
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76.9
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.79
Average core power density [kW/dm <sup>3</sup> ]	: 99.87
Average fuel power density [kW/kgU]	: 39.9
Fuel linear heat generation rate [kW/m]	: 23.8

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: Other - TURBINE TRIP
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 192
Operating coolant pressure [MPa]	: 15.41
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 285.1
Coolant mass flow at the rated power [t/h]	: 16276

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Superheated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 958
Design heat transfer surface [m <sup>2</sup> ]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.6
Design pressure difference [MPa]	: 0.85

### Pressurizer

Total volume [m <sup>3</sup> ]	: 39.7
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: <Not Available>
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 68000

Number of containment spray pumps	: 6
Containment design pressure [MPa]	: 0.41
Design leakage rate [% per day]	: 0.178
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 136.2
LPSI system flowrate [t/h]	: 910

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.65
HP cylinder Inlet steam moisture [%]	: 0.2
HP cylinder inlet steam temperature [°C]	: 267.5
HP cylinder Inlet steam flow rate [t/h]	: 720

### Main generator

Rated active power [MWe]	: 435
Rated apparent power [MVA]	: 540
Output voltage [kV]	: 18
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 6

Number of main condensate pumps required for full power : 4

Condenser vacuum at the full power (absolute pressure) [kPa] : 4

### Feedwater system

Number of turbine driven main feedwater pumps : 4

Number of motor-driven main feedwater pumps : 4

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 7.5

Steam generator feedwater inlet temperature [°C] : 225

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related cables

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 2

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 3

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 1

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : 0

Estimated time reserve of the batteries at full load [h] : 3

Total installed capacity of the on-site emergency power sources per unit [MW] : 11.5

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1650

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : Main Steam

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.173
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.35
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82.2
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 42
Fuel linear heat generation rate [kW/m]	: 17.85

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GDO2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 32

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.52
Reactor outlet temperature [°C]	: 324.7
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 15176

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 39.78
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1404

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m3]	:

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.35
Design leakage rate [% per day]	:
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12
LPSI system pressure [MPa]	: 2
HPSI system flowrate [t/h]	: 250
LPSI system flowrate [t/h]	: 470

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.4
HP cylinder Inlet steam moisture [%]	: 0.016
HP cylinder inlet steam temperature [°C]	: 268
HP cylinder Inlet steam flow rate [t/h]	: 1511

### Main generator

Rated active power [MWe]	: 941
Rated apparent power [MVA]	: 1130
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Stainles Steel
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : <Not Available>

Steam generator feedwater inlet temperature [°C] : 225

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related cables

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 2

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 3

Number of on-site safety related diesel generators (available per unit) : 6

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 1

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : 0

Estimated time reserve of the batteries at full load [h] : 3

Total installed capacity of the on-site emergency power sources per unit [MW] : 35

Total battery capacity [Ah] : <Not Available>

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 800

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : Main Steam

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.985
Inside shell diameter [m]	: 3.998
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.35
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 84.5
Moderator weight [t]	: 200
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 96.45
Average fuel power density [kW/kgU]	: 35.5
Fuel linear heat generation rate [kW/m]	: 16.47

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 200
Operating coolant pressure [MPa]	: 15.52
Reactor outlet temperature [°C]	: 330.3
Reactor inlet temperature [°C]	: 293.6
Coolant mass flow at the rated power [t/h]	: 16566

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m <sup>2</sup> ]	: 7918

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m <sup>3</sup> ]	: 45
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1604

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 70000



Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.35
Design leakage rate [% per day]	:
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12
LPSI system pressure [MPa]	: 2
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 7.28
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 291
HP cylinder Inlet steam flow rate [t/h]	: 1667

### Main generator

Rated active power [MWe]	: 1054
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: <Not Available>
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 6.5

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	:
Steam generator feedwater inlet temperature [°C]	: <Not Available>

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 3
Number of on-site safety related diesel generators (available per unit)	: 6
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 0
Estimated time reserve of the batteries at full load [h]	:
Total installed capacity of the on-site emergency power sources per unit [MW]	:
Total battery capacity [Ah]	:

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 800
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: Main Steam
Number of heat connection points per unit	: <Not Available>
Number of intermediate circuits/heat exchangers	: <Not Available>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

BR-1

ANGRA-1

BRAZIL

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA 508-CL-12
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304 INCONEL
Reactor vessel overall length/height [m]	: 11.89
Inside shell diameter [m]	: 3.35
Shell thickness [mm]	: 170
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 35.1
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 2.47
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49.3
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 235
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 107.9
Average fuel power density [kW/kgU]	: 33
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: <Not Available>
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.71
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 287.5
Coolant mass flow at the rated power [t/h]	: 16100

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	:
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>

Total containment volume [m3]	:
Number of containment spray pumps	:
Containment design pressure [MPa]	: 4.27
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.05
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 275
HP cylinder Inlet steam flow rate [t/h]	: 3.85

### Main generator

Rated active power [MWe]	: 684
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -

Number of main condensate pumps	: -
Number of main condensate pumps required for full power	: -
Condenser vacuum at the full power (absolute pressure) [kPa]	: -

#### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	: -
Feedwater discharge pressure [MPa]	: -
Steam generator feedwater inlet temperature [°C]	: -

#### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

#### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: -
Number of on site non-safety related gas turbines	: -
Other on-site emergency AC power sources	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 20-MNMONI-55
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: STAB.AUSTH.STEEL
Reactor vessel overall length/height [m]	: 12.31
Inside shell diameter [m]	: 5.02
Shell thickness [mm]	: 250
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.5
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 35000
Active core diameter [m]	: 3.61
Active core height/length [m]	: 3.9
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103
Moderator weight [t]	: 383.9
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.72
Average core power density [kW/dm <sup>3</sup> ]	: 93.17
Average fuel power density [kW/kgU]	: 36.4
Fuel linear heat generation rate [kW/m]	: 20.79

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: Boron
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 383.9
Operating coolant pressure [MPa]	: 15.9
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 21800

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Incoloy 800
SG shell material	: 20MnMoNi55
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 945.5
Design heat transfer surface [m <sup>2</sup> ]	: 5400

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.58
Design pressure difference [MPa]	: 0.65

### Pressurizer

Total volume [m <sup>3</sup> ]	: 65
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2047

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: Vacuum Building
Total containment volume [m <sup>3</sup> ]	: 70387

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.53
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 8
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 10.9
LPSI system pressure [MPa]	: 1.0
HPSI system flowrate [t/h]	: 225
LPSI system flowrate [t/h]	: 1260

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.295
HP cylinder Inlet steam moisture [%]	: 0.998
HP cylinder inlet steam temperature [°C]	: 284.5
HP cylinder Inlet steam flow rate [t/h]	: 7200

### Main generator

Rated active power [MWe]	: 1350
Rated apparent power [MVA]	: 1275
Output voltage [kV]	: 25
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.4

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 2
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.2
Steam generator feedwater inlet temperature [°C]	: 218

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 4
Number of diesel driven pumps	: 4
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 8
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 2.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 6.26
Total battery capacity [Ah]	: 12000

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1084
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

BG-5

KOZLODUY-5

BULGARIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR
Average fuel enrichment [% of U235]	: <Not Available>
Refuelling frequency [month]	: 15
Part of the core refuelled [%]	: 50
Average discharge burnup [MWd/t]	: 27000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.55
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 111
Average fuel power density [kW/kgU]	: 45.5
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: <Not Available>
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	:

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 320
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 84000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Available>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Available>

Total containment volume [m3]	:
Number of containment spray pumps	:
Containment design pressure [MPa]	:
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 5980

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>



Number of main condensate pumps	:
Number of main condensate pumps required for full power	:
Condenser vacuum at the full power (absolute pressure) [kPa]	:

**Feedwater system**

Number of turbine driven main feedwater pumps	: 3
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.6
Steam generator feedwater inlet temperature [°C]	: 220

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 5
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	:
Cable segregation within the unit used for	:
On-site fire brigade	:
Off-site fire brigade response time	:

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 2
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 18.9
Total battery capacity [Ah]	: 1500

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 27000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.55
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 111
Average fuel power density [kW/kgU]	: 45.5
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 320
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 84000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Available>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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CANADA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: 304L SS CALANDRIA
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.951
Inside shell diameter [m]	: 8.52
Shell thickness [mm]	: 31.7
Number of pressure channels	: -
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 8750
Active core diameter [m]	: 5.67
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 119
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 19
Average fuel power density [kW/kgU]	: 24
Fuel linear heat generation rate [kW/m]	: 24.5

#### Reactivity control



Control rod material	: Cadmium SS
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9.36
Reactor outlet temperature [°C]	: 300
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 43200

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: ELEC-MECH
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.74
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.37
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 254
HP cylinder Inlet steam flow rate [t/h]	: 4450

### Main generator

Rated active power [MWe]	: 825
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -

Number of main condensate pumps	: -
Number of main condensate pumps required for full power	: -
Condenser vacuum at the full power (absolute pressure) [kPa]	: -

#### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	: -
Feedwater discharge pressure [MPa]	: -
Steam generator feedwater inlet temperature [°C]	: -

#### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

#### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: -
Number of on site non-safety related gas turbines	: -
Other on-site emergency AC power sources	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: 304L SS CALANDRIA
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.951
Inside shell diameter [m]	: 8.52
Shell thickness [mm]	: 31.7
Number of pressure channels	: -
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 8750
Active core diameter [m]	: 5.67
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 119
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 19
Average fuel power density [kW/kgU]	: 24
Fuel linear heat generation rate [kW/m]	: 24.5

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9.36
Reactor outlet temperature [°C]	: 300
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 43200

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: ELEC-MECH
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.74
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.37
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 254
HP cylinder Inlet steam flow rate [t/h]	: 4450

### Main generator

Rated active power [MWe]	: 825
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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CANADA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: 304L SS CALANDRIA
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.951
Inside shell diameter [m]	: 8.52
Shell thickness [mm]	: 31.7
Number of pressure channels	: 380
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 8750
Active core diameter [m]	: 5.67
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 119
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 19
Average fuel power density [kW/kgU]	: 24
Fuel linear heat generation rate [kW/m]	: 24.5

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9.36
Reactor outlet temperature [°C]	: 300
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 43200

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: ELEC-MECH
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.74
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.37
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 254
HP cylinder Inlet steam flow rate [t/h]	: 4450

### Main generator

Rated active power [MWe]	: 825
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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BRUCE-4

CANADA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: 304L SS CALANDRIA
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.951
Inside shell diameter [m]	: 8.52
Shell thickness [mm]	: 31.7
Number of pressure channels	: 480
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	:

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	:
Average discharge burnup [MWd/t]	: 8750
Active core diameter [m]	: 5.67
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 119
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 19
Average fuel power density [kW/kgU]	: 24
Fuel linear heat generation rate [kW/m]	: 24.5

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	:
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: D2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 9.36
Reactor outlet temperature [°C]	: 300
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 43200

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: ELEC-MECH
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:



Number of containment spray pumps	:
Containment design pressure [MPa]	: 1.74
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.37
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 254
HP cylinder Inlet steam flow rate [t/h]	: 4450

### Main generator

Rated active power [MWe]	: 825
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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CANADA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: 304L SS CALANDRIA
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.951
Inside shell diameter [m]	: 8.52
Shell thickness [mm]	: 31.7
Number of pressure channels	: 480
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 7710
Active core diameter [m]	: 5.67
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 119
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 18.9
Average fuel power density [kW/kgU]	: 23.8
Fuel linear heat generation rate [kW/m]	: 24.5

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9.49
Reactor outlet temperature [°C]	: 305
Reactor inlet temperature [°C]	: 257
Coolant mass flow at the rated power [t/h]	: 44000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: ELEC-MECH
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.88
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 260
HP cylinder Inlet steam flow rate [t/h]	: 4933

### Main generator

Rated active power [MWe]	: 915
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: 304L SS CALANDRIA
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.951
Inside shell diameter [m]	: 8.52
Shell thickness [mm]	: 31.7
Number of pressure channels	: 480
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 7710
Active core diameter [m]	: 5.67
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 119
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 18.9
Average fuel power density [kW/kgU]	: 23.8
Fuel linear heat generation rate [kW/m]	: 24.5

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9.49
Reactor outlet temperature [°C]	: 305
Reactor inlet temperature [°C]	: 257
Coolant mass flow at the rated power [t/h]	: 44000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: ELEC-MECH
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.88
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 260
HP cylinder Inlet steam flow rate [t/h]	: 4933

### Main generator

Rated active power [MWe]	: 915
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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CANADA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: 304L SS CALANDRIA
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.951
Inside shell diameter [m]	: 8.52
Shell thickness [mm]	: 31.7
Number of pressure channels	: 480
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 7710
Active core diameter [m]	: 5.67
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 119
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 18.9
Average fuel power density [kW/kgU]	: 23.8
Fuel linear heat generation rate [kW/m]	: 24.5

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9.49
Reactor outlet temperature [°C]	: 305
Reactor inlet temperature [°C]	: 257
Coolant mass flow at the rated power [t/h]	: 44000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: ELEC-MECH
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.88
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 260
HP cylinder Inlet steam flow rate [t/h]	: 4933

### Main generator

Rated active power [MWe]	: 915
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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CANADA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: 304L SS CALANDRIA
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.951
Inside shell diameter [m]	: 8.52
Shell thickness [mm]	: 31.7
Number of pressure channels	: 480
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 7710
Active core diameter [m]	: 5.67
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 119
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 18.9
Average fuel power density [kW/kgU]	: 23.8
Fuel linear heat generation rate [kW/m]	: 24.5

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9.49
Reactor outlet temperature [°C]	: 305
Reactor inlet temperature [°C]	: 257
Coolant mass flow at the rated power [t/h]	: 9300

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: ELEC-MECH
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.88
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 260
HP cylinder Inlet steam flow rate [t/h]	: 4933

### Main generator

Rated active power [MWe]	: 915
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: ASME SA240 Type 304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 5.029
Inside shell diameter [m]	: 8.458
Shell thickness [mm]	: 31.75
Number of pressure channels	: 480
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.23

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 0.72
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 8625
Active core diameter [m]	: 7.068
Active core height/length [m]	: 6.06
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 136.42
Moderator weight [t]	: 334.4
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.419
Average core power density [kW/dm <sup>3</sup> ]	: 11.91
Average fuel power density [kW/kgU]	: 46.62
Fuel linear heat generation rate [kW/m]	: 24

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gadolinium nitrate
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 220
Operating coolant pressure [MPa]	: 10
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 38412

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: 4
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	: Carbon Steel
Drum separator shell material	: Carbon Steel
Design thermal capacity per SG [MW]	: 664
Design heat transfer surface [m2]	: 4830

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 9.4
Design pressure difference [MPa]	: 1.9

### Pressurizer

Total volume [m3]	: 63.63
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1500

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 48477

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.0965
Design leakage rate [% per day]	: 4.29
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 6
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 4.03
LPSI system pressure [MPa]	: 1.72
HPSI system flowrate [t/h]	: 1638
LPSI system flowrate [t/h]	: 6840

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 1

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 4.93
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 263
HP cylinder Inlet steam flow rate [t/h]	: 4710.56

### Main generator

Rated active power [MWe]	: 936
Rated apparent power [MVA]	: 1101
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Stainles Steel
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.2

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 4
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 3
Feedwater discharge pressure [MPa]	: 5.07
Steam generator feedwater inlet temperature [°C]	: 176.7

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 4
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 4
Number of on-site safety related diesel generators (available per unit)	: <Not Applicable>
Number of on-site safety related gas turbines (available per unit)	: 4
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 2 emergency power generators, gas turbines
Estimated time reserve of the batteries at full load [h]	: 0.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 6.8
Total battery capacity [Ah]	: 3340

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 370944
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: Main Steam
Number of heat connection points per unit	: 5
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: 0.96

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: ASME SA240 Type 304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 5.029
Inside shell diameter [m]	: 8.458
Shell thickness [mm]	: 31.75
Number of pressure channels	: 480
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.23

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 0.72
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 8625
Active core diameter [m]	: 7.068
Active core height/length [m]	: 6.06
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 136.42
Moderator weight [t]	: 334.4
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.419
Average core power density [kW/dm <sup>3</sup> ]	: 11.91
Average fuel power density [kW/kgU]	: 46.62
Fuel linear heat generation rate [kW/m]	: 24

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gadolinium nitrate
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 220
Operating coolant pressure [MPa]	: 10
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 38412

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: 4
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	: Carbon Steel
Drum separator shell material	: Carbon Steel
Design thermal capacity per SG [MW]	: 664
Design heat transfer surface [m2]	: 4830

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 9.4
Design pressure difference [MPa]	: 1.9

### Pressurizer

Total volume [m3]	: 63.63
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1500

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 48477

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.0965
Design leakage rate [% per day]	: 4.29
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 6
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 4.03
LPSI system pressure [MPa]	: 1.72
HPSI system flowrate [t/h]	: 1638
LPSI system flowrate [t/h]	: 6840

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 1

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 4.93
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 263
HP cylinder Inlet steam flow rate [t/h]	: 4710.56

### Main generator

Rated active power [MWe]	: 936
Rated apparent power [MVA]	: 1101
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Stainles Steel
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.2

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 4
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 3
Feedwater discharge pressure [MPa]	: 5.07
Steam generator feedwater inlet temperature [°C]	: 176.7

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 4
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 4
Number of on-site safety related diesel generators (available per unit)	: <Not Applicable>
Number of on-site safety related gas turbines (available per unit)	: 4
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 2 emergency power generators, gas turbines
Estimated time reserve of the batteries at full load [h]	: 0.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 6.8
Total battery capacity [Ah]	: 3340

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 370944
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: Main Steam
Number of heat connection points per unit	: 5
Number of intermediate circuits/heat exchangers	: <Not Available>



Total capacity of heat connections [MWt]	: <Not Available>
Extraction steam pressure [MPa]	: 0.96

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: ASME SA240 Type 304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 5.029
Inside shell diameter [m]	: 8.458
Shell thickness [mm]	: 31.75
Number of pressure channels	: 480
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.23

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 0.72
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 8625
Active core diameter [m]	: 7.068
Active core height/length [m]	: 6.06
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 136.42
Moderator weight [t]	: 334.4
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.419
Average core power density [kW/dm <sup>3</sup> ]	: 11.91
Average fuel power density [kW/kgU]	: 46.62
Fuel linear heat generation rate [kW/m]	: 24

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gadolinium nitrate
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 220
Operating coolant pressure [MPa]	: 10
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 38412

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: 4
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	: Carbon Steel
Drum separator shell material	: Carbon Steel
Design thermal capacity per SG [MW]	: 664
Design heat transfer surface [m2]	: 4830

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 9.4
Design pressure difference [MPa]	: 1.9

### Pressurizer

Total volume [m3]	: 63.63
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1500

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 48477

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.0965
Design leakage rate [% per day]	: 4.29
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 6
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 4.03
LPSI system pressure [MPa]	: 1.72
HPSI system flowrate [t/h]	: 1638
LPSI system flowrate [t/h]	: 6840

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 1

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 4.93
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 263
HP cylinder Inlet steam flow rate [t/h]	: 4710.56

### Main generator

Rated active power [MWe]	: 936
Rated apparent power [MVA]	: 1101
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Stainles Steel
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.2

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 4
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 3
Feedwater discharge pressure [MPa]	: 5.07
Steam generator feedwater inlet temperature [°C]	: 176.7

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 4
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 4
Number of on-site safety related diesel generators (available per unit)	: <Not Applicable>
Number of on-site safety related gas turbines (available per unit)	: 4
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 2 emergency power generators, gas turbines
Estimated time reserve of the batteries at full load [h]	: 0.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 6.8
Total battery capacity [Ah]	: 3340

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 370944
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: Main Steam
Number of heat connection points per unit	: 5
Number of intermediate circuits/heat exchangers	: <Not Available>

Total capacity of heat connections [MWt]	: <Not Available>
Extraction steam pressure [MPa]	: 0.96

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: ASME SA240 Type 304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 5.029
Inside shell diameter [m]	: 8.458
Shell thickness [mm]	: 31.75
Number of pressure channels	: 480
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.23

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 0.72
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 8625
Active core diameter [m]	: 7.068
Active core height/length [m]	: 6.06
Number of fissile fuel assemblies/bundles	: 6240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 136.42
Moderator weight [t]	: 334.4
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.419
Average core power density [kW/dm <sup>3</sup> ]	: 11.91
Average fuel power density [kW/kgU]	: 46.62
Fuel linear heat generation rate [kW/m]	: 24

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gadolinium nitrate
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 220
Operating coolant pressure [MPa]	: 10
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 38412

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: 4
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	: Carbon Steel
Drum separator shell material	: Carbon Steel
Design thermal capacity per SG [MW]	: 664
Design heat transfer surface [m2]	: 4830

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 9.4
Design pressure difference [MPa]	: 1.9

### Pressurizer

Total volume [m3]	: 63.63
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1500

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 48477



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.0965
Design leakage rate [% per day]	: 4.29
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 6
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 4.03
LPSI system pressure [MPa]	: 1.72
HPSI system flowrate [t/h]	: 1638
LPSI system flowrate [t/h]	: 6840

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 1

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 4.93
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 263
HP cylinder Inlet steam flow rate [t/h]	: 4710.56

### Main generator

Rated active power [MWe]	: 936
Rated apparent power [MVA]	: 1101
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Stainles Steel
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.2

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 4
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 3
Feedwater discharge pressure [MPa]	: 5.07
Steam generator feedwater inlet temperature [°C]	: 176.7

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 4
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 4
Number of on-site safety related diesel generators (available per unit)	: <Not Applicable>
Number of on-site safety related gas turbines (available per unit)	: 4
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 2 emergency power generators, gas turbines
Estimated time reserve of the batteries at full load [h]	: 0.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 6.8
Total battery capacity [Ah]	: 3340

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 370944
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: Main Steam
Number of heat connection points per unit	: 5
Number of intermediate circuits/heat exchangers	: <Not Available>

Total capacity of heat connections [MWt]	: <Not Available>
Extraction steam pressure [MPa]	: 0.96

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.94
Inside shell diameter [m]	: 8.09
Shell thickness [mm]	: 114
Number of pressure channels	: -
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 9080
Active core diameter [m]	: 5.94
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4680
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 92.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 28
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 15.3
Average fuel power density [kW/kgU]	: 18.4
Fuel linear heat generation rate [kW/m]	: 26.6

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 6

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 27820

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 12
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: MONEL-400
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 16
Number of pumps per RCS loop	: 8
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.46
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 246
HP cylinder Inlet steam flow rate [t/h]	: 2930

### Main generator

Rated active power [MWe]	: 542
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.94
Inside shell diameter [m]	: 8.09
Shell thickness [mm]	: 114
Number of pressure channels	: 380
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 9080
Active core diameter [m]	: 5.94
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 92.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 28
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 15.3
Average fuel power density [kW/kgU]	: 18.4
Fuel linear heat generation rate [kW/m]	: 26.6

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 6

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 27820

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 12
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: MONEL-400
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 16
Number of pumps per RCS loop	: 8
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.46
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 246
HP cylinder Inlet steam flow rate [t/h]	: 2930

### Main generator

Rated active power [MWe]	: 542
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.94
Inside shell diameter [m]	: 7.6
Shell thickness [mm]	: 26.8
Number of pressure channels	: 480
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 8330
Active core diameter [m]	: 5.94
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 90.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 28
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 15.3
Average fuel power density [kW/kgU]	: 19
Fuel linear heat generation rate [kW/m]	: 27.3

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9
Reactor outlet temperature [°C]	: 293.4
Reactor inlet temperature [°C]	: 249.5
Coolant mass flow at the rated power [t/h]	: 27820

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 12
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: MONEL-400
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 16
Number of pumps per RCS loop	: 8
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.46
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 246
HP cylinder Inlet steam flow rate [t/h]	: 2930

### Main generator

Rated active power [MWe]	: 540
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.94
Inside shell diameter [m]	: 7.6
Shell thickness [mm]	: 26.8
Number of pressure channels	: 480
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 8330
Active core diameter [m]	: 5.94
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 90.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 28
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 15.3
Average fuel power density [kW/kgU]	: 19
Fuel linear heat generation rate [kW/m]	: 27.3

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9
Reactor outlet temperature [°C]	: 293.4
Reactor inlet temperature [°C]	: 249.5
Coolant mass flow at the rated power [t/h]	: 27820

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 12
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: MONEL-400
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 16
Number of pumps per RCS loop	: 8
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.46
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 246
HP cylinder Inlet steam flow rate [t/h]	: 2930

### Main generator

Rated active power [MWe]	: 540
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.94
Inside shell diameter [m]	: 7.6
Shell thickness [mm]	: 26.8
Number of pressure channels	: 480
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub> /PuO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 8330
Active core diameter [m]	: 5.94
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 90.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 28
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 15.3
Average fuel power density [kW/kgU]	: 19
Fuel linear heat generation rate [kW/m]	: 27.3

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9
Reactor outlet temperature [°C]	: 293.4
Reactor inlet temperature [°C]	: 249.5
Coolant mass flow at the rated power [t/h]	: 27820

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 12
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: MONEL-400
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 16
Number of pumps per RCS loop	: 8
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.46
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 246
HP cylinder Inlet steam flow rate [t/h]	: 2930

### Main generator

Rated active power [MWe]	: 540
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.94
Inside shell diameter [m]	: 7.6
Shell thickness [mm]	: 26.8
Number of pressure channels	: 480
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 8330
Active core diameter [m]	: 5.94
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 90.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 28
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 15.3
Average fuel power density [kW/kgU]	: 19
Fuel linear heat generation rate [kW/m]	: 27.3

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 9
Reactor outlet temperature [°C]	: 293.4
Reactor inlet temperature [°C]	: 249.5
Coolant mass flow at the rated power [t/h]	: 27820

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 12
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: MONEL-400
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 16
Number of pumps per RCS loop	: 8
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.46
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 246
HP cylinder Inlet steam flow rate [t/h]	: 2930

### Main generator

Rated active power [MWe]	: 540
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: ZR-NB
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.99
Inside shell diameter [m]	: 0.104
Shell thickness [mm]	: 4.34
Number of pressure channels	: 480
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 8000
Active core diameter [m]	: 6.28
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 87.76
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 11.69
Average fuel power density [kW/kgU]	: 24.9
Fuel linear heat generation rate [kW/m]	: 59.5

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 11.55
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 27360

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.3
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.64
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 258
HP cylinder Inlet steam flow rate [t/h]	: 4100

### Main generator

Rated active power [MWe]	: 680
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

CN-2

DAYA BAY-1

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 16- MND-5
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 308L-309L
Reactor vessel overall length/height [m]	: 13.208
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 212
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 35000
Active core diameter [m]	: -
Active core height/length [m]	: -
Number of fissile fuel assemblies/bundles	: -
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.4
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 109
Average fuel power density [kW/kgU]	: 39.93
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Cadmium Alloy
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.81
Reactor outlet temperature [°C]	: 327.6
Reactor inlet temperature [°C]	: 292.4
Coolant mass flow at the rated power [t/h]	: 68520

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: -
Tube material	: INCONEL-690
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -



Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5.2
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.76
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282.1
HP cylinder Inlet steam flow rate [t/h]	: 5810

### Main generator

Rated active power [MWe]	: 983.8
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -

Number of main condensate pumps	: -
Number of main condensate pumps required for full power	: -
Condenser vacuum at the full power (absolute pressure) [kPa]	: -

#### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	: -
Feedwater discharge pressure [MPa]	: -
Steam generator feedwater inlet temperature [°C]	: -

#### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

#### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: -
Number of on site non-safety related gas turbines	: -
Other on-site emergency AC power sources	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 16- MND-5
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 308L-309L
Reactor vessel overall length/height [m]	: 13.208
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 212
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 35000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.4
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 109
Average fuel power density [kW/kgU]	: 39.93
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.81
Reactor outlet temperature [°C]	: 327.6
Reactor inlet temperature [°C]	: 292.4
Coolant mass flow at the rated power [t/h]	: 68520

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: -
Tube material	: INCONEL-690
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5.2
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.76
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282.1
HP cylinder Inlet steam flow rate [t/h]	: 5810

### Main generator

Rated active power [MWe]	: 983.8
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



CN-24

FANGJIASHAN-1

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 16MND5
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: 308L+309L
Reactor vessel overall length/height [m]	: 13.2
Inside shell diameter [m]	: 3.989
Shell thickness [mm]	: 202
Number of pressure channels	: <Not Available>
Pressure channel material	: <Not Available>
Pressure channel wall thickness [mm]	: <Not Available>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: M5
Average fuel enrichment [% of U235]	: 2.4
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Available>
Fuel weight [t]	: 72.14
Moderator weight [t]	: 199
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 107.2
Average fuel power density [kW/kgU]	: 40
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: <Not Available>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 199
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.6
Reactor inlet temperature [°C]	: 292.4
Coolant mass flow at the rated power [t/h]	: 64066

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Superheated Steam
Number of SG	: 3
Number of drum separators	: <Not Available>
Tube shape	: U-tube
Tube material	: Inconel-690
SG shell material	: sa-508
Drum separator shell material	: stainless steel
Design thermal capacity per SG [MW]	: 968.3
Design heat transfer surface [m2]	: 5429

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 7.5
Design pressure difference [MPa]	: 0.97

### Pressurizer

Total volume [m3]	: 39.75
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 49400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.52
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: 17.7
LPSI system pressure [MPa]	: 2.2
HPSI system flowrate [t/h]	: 68
LPSI system flowrate [t/h]	: 1700

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.43
HP cylinder Inlet steam moisture [%]	: 0.47
HP cylinder inlet steam temperature [°C]	: 280.1
HP cylinder Inlet steam flow rate [t/h]	: 5803

### Main generator

Rated active power [MWe]	: 1150
Rated apparent power [MVA]	: 1278
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.1

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.3
Steam generator feedwater inlet temperature [°C]	: 226

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Available>
Other on-site emergency AC power sources	: 2
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 12
Total battery capacity [Ah]	: 13715

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1206
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 1049

### Non-electrical applications

Primary heat connection	: -
Number of heat connection points per unit	: -
Number of intermediate circuits/heat exchangers	: -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

CN-20

FUQING-1

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 16MND5
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: 309L/308L
Reactor vessel overall length/height [m]	: 13.2
Inside shell diameter [m]	: 3.989
Shell thickness [mm]	: 204
Number of pressure channels	: <Not Available>
Pressure channel material	: <Not Available>
Pressure channel wall thickness [mm]	: <Not Available>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: M5
Average fuel enrichment [% of U235]	: 2.4
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 3.2
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Available>
Fuel weight [t]	: 82.111
Moderator weight [t]	: 199
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 107.2
Average fuel power density [kW/kgU]	: 40
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B2O3
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 199
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.6
Reactor inlet temperature [°C]	: 292.4
Coolant mass flow at the rated power [t/h]	: 52956

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Inconel-690
SG shell material	: 18MND5
Drum separator shell material	: stainless steel
Design thermal capacity per SG [MW]	: 968
Design heat transfer surface [m2]	: 5429

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 6.5
Design pressure difference [MPa]	: 0.97

### Pressurizer

Total volume [m3]	: 39.75
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 49400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.52
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 21.2
LPSI system pressure [MPa]	: 2.2
HPSI system flowrate [t/h]	: 68
LPSI system flowrate [t/h]	: 1700

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.43
HP cylinder Inlet steam moisture [%]	: 0.47
HP cylinder inlet steam temperature [°C]	: 280.1
HP cylinder Inlet steam flow rate [t/h]	: 42.36

### Main generator

Rated active power [MWe]	: 1278
Rated apparent power [MVA]	: 1150
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3



Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.1

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.72
Steam generator feedwater inlet temperature [°C]	: 226

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: 2
Number of on site non-safety related gas turbines	: <Not Available>
Other on-site emergency AC power sources	: 0
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 15.7
Total battery capacity [Ah]	: 13715

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1206
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 1206

### Non-electrical applications

Primary heat connection	: -
Number of heat connection points per unit	: -
Number of intermediate circuits/heat exchangers	: -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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HONGYANHE-1

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: <Not Available>
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: <Not Available>
Reactor vessel overall length/height [m]	: <Not Applicable>
Inside shell diameter [m]	: 3.989
Shell thickness [mm]	: 202
Number of pressure channels	: <Not Available>
Pressure channel material	: <Not Available>
Pressure channel wall thickness [mm]	: <Not Available>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: <Not Available>
Average fuel enrichment [% of U235]	: 2.43
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: <Not Applicable>
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: 157
Fuel weight [t]	: 81.917
Moderator weight [t]	: 15.09
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 109
Average fuel power density [kW/kgU]	: 39.95
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: <Not Available>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 283
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.6
Reactor inlet temperature [°C]	: 291.4
Coolant mass flow at the rated power [t/h]	: 71370

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: <Not Available>
SG shell material	: <Not Available>
Drum separator shell material	: <Not Available>
Design thermal capacity per SG [MW]	: 968.3
Design heat transfer surface [m2]	: 5429

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 6.5
Design pressure difference [MPa]	: 1

### Pressurizer

Total volume [m3]	: 39.7
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: 50000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.52
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 17.67
LPSI system pressure [MPa]	: 2.2
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 850

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.11
HP cylinder Inlet steam moisture [%]	: 0.69
HP cylinder inlet steam temperature [°C]	: 276.7
HP cylinder Inlet steam flow rate [t/h]	: 5814

### Main generator

Rated active power [MWe]	: 1118.79
Rated apparent power [MVA]	: 1278
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 3.6

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.6
Steam generator feedwater inlet temperature [°C]	: 226

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: 2
Number of turbine driven pumps	: 2

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: <Not Available>
Number of on site non-safety related gas turbines	: <Not Available>
Other on-site emergency AC power sources	: <Not Available>
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 15.75
Total battery capacity [Ah]	: 31340

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1206
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	:

**Non-electrical applications**

Primary heat connection	: -
Number of heat connection points per unit	: -
Number of intermediate circuits/heat exchangers	: -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

CN-17

HONGYANHE-2

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: <Not Available>
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: <Not Available>
Reactor vessel overall length/height [m]	: <Not Applicable>
Inside shell diameter [m]	: 3.989
Shell thickness [mm]	: 202
Number of pressure channels	: <Not Available>
Pressure channel material	: <Not Available>
Pressure channel wall thickness [mm]	: <Not Available>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: <Not Available>
Average fuel enrichment [% of U235]	: 2.43
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: <Not Applicable>
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: 157
Fuel weight [t]	: 81.917
Moderator weight [t]	: 15.09
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 109
Average fuel power density [kW/kgU]	: 39.95
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: <Not Available>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 283
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.6
Reactor inlet temperature [°C]	: 291.4
Coolant mass flow at the rated power [t/h]	: 71370

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: <Not Available>
SG shell material	: <Not Available>
Drum separator shell material	: <Not Available>
Design thermal capacity per SG [MW]	: 968.3
Design heat transfer surface [m2]	: 5429

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 6.5
Design pressure difference [MPa]	: 1

### Pressurizer

Total volume [m3]	: 39.7
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: 50000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.52
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 17.67
LPSI system pressure [MPa]	: 2.2
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 850

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: <Not Applicable>
HP cylinder Inlet steam moisture [%]	: 0.69
HP cylinder inlet steam temperature [°C]	: <Not Applicable>
HP cylinder Inlet steam flow rate [t/h]	: 5814

### Main generator

Rated active power [MWe]	: 1118.79
Rated apparent power [MVA]	: 1278
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 3.6

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.6
Steam generator feedwater inlet temperature [°C]	: 226

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: 2
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: <Not Available>
Number of on site non-safety related gas turbines	: <Not Available>
Other on-site emergency AC power sources	: <Not Available>
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 15.75
Total battery capacity [Ah]	: 31340

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1206
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: -
Number of heat connection points per unit	: -
Number of intermediate circuits/heat exchangers	: -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

CN-6

LING AO-1

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: <Not Available>
Reactor vessel material specification	: -
Vessel cladding material	: <Not Available>
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: -
Inside shell diameter [m]	: -
Shell thickness [mm]	: -
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: <Not Available>
Fuel clad material specification	: -
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: -
Active core diameter [m]	: -
Active core height/length [m]	: -
Number of fissile fuel assemblies/bundles	: -
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: -
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: -
Fuel clad thickness [mm]	: -
Average core power density [kW/dm <sup>3</sup> ]	: -
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: -
Reactor outlet temperature [°C]	: -
Reactor inlet temperature [°C]	: -
Coolant mass flow at the rated power [t/h]	: -

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: <Not Available>
Number of drum separators	: <Not Applicable>
Tube shape	: -
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: <Not Available>
Number of pumps per RCS loop	: <Not Available>
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: <Not Available>
Turbine speed [rpm]	: <Not Available>
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: -
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: <Not Available>
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: <Not Available>
Reactor vessel material specification	: -
Vessel cladding material	: <Not Available>
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: -
Inside shell diameter [m]	: -
Shell thickness [mm]	: -
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: <Not Available>
Fuel clad material specification	: -
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: -
Active core diameter [m]	: -
Active core height/length [m]	: -
Number of fissile fuel assemblies/bundles	: -
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: -
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: -
Fuel clad thickness [mm]	: -
Average core power density [kW/dm <sup>3</sup> ]	: -
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: -
Reactor outlet temperature [°C]	: -
Reactor inlet temperature [°C]	: -
Coolant mass flow at the rated power [t/h]	: -

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: <Not Available>
Number of drum separators	: <Not Applicable>
Tube shape	: -
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: <Not Available>
Number of pumps per RCS loop	: <Not Available>
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.6
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: <Not Available>
Turbine speed [rpm]	: <Not Available>
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: -
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: <Not Available>
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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LING AO-3

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: -
Reactor vessel centreline orientation	: -
Reactor vessel material	: -
Reactor vessel material specification	: -
Vessel cladding material	: -
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: -
Inside shell diameter [m]	: -
Shell thickness [mm]	: -
Number of pressure channels	: -
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: -
Fuel Form	: -
Fuel material	: -
Refuelling type	: -
Moderator material	: -
Fuel clad material	: -
Fuel clad material specification	: -
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: -
Active core diameter [m]	: -
Active core height/length [m]	: -
Number of fissile fuel assemblies/bundles	: -
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: -
Fuel weight [t]	: -
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: -
Fuel clad thickness [mm]	: -
Average core power density [kW/dm <sup>3</sup> ]	: -
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: -
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Burnable neutron absorber material	: -
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: -
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

---

Number of external reactor coolant loops	: -
Coolant type	: -
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: -
Reactor outlet temperature [°C]	: -
Reactor inlet temperature [°C]	: -
Coolant mass flow at the rated power [t/h]	: -

### Steam generators (SG)/drum separators

---

Type of SG	: -
SG output	: -
Number of SG	: -
Number of drum separators	: -
Tube shape	: -
Tube material	: -
SG shell material	: -
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m <sup>2</sup> ]	: -

### Main coolant pumps/circulators

---

Total number of pumps/circulators	: -
Number of pumps per RCS loop	: -
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

---

Total volume [m <sup>3</sup> ]	: -
Number of safety valves	: -
Number of relief valves	: -
Installed heater power [kW]	: -

### Containment systems

---

Containment type	: -
Containment Shape	: -
Containment structure	: -
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m <sup>3</sup> ]	: -

---



Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: -
Number of LPSI systems	: -
Number of hydroaccumulators	: -
Number of core spray system pumps (BWR)	: -
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: -

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: -

## Secondary systems

### Turbine

Turbine type	: -
Number of turbine-generators per unit/reactor	: -
Turbine speed [rpm]	: -
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: -
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: -
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: -
Number of condensers per turbine-generator	: -
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : -

Number of motor-driven main feedwater pumps : -

Number of start-up feed-water pumps (if different from the auxiliary FWP) : -

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : -

Number of diesel driven pumps : -

Number of turbine driven pumps : -

### Fire protection system

On-site fire suppression/extinguishing system : -

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : -

Number of alternate power sources from the transmission grid (standby transformers available per unit) : -

Number of on-site safety related diesel generators (available per unit) : -

Number of on-site safety related gas turbines (available per unit) : -

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : -

Interim storage facility type : -

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : -

Number of heat connection points per unit : -

Number of intermediate circuits/heat exchangers : -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: -
Reactor vessel centreline orientation	: -
Reactor vessel material	: -
Reactor vessel material specification	: -
Vessel cladding material	: -
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: -
Inside shell diameter [m]	: -
Shell thickness [mm]	: -
Number of pressure channels	: -
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: -
Fuel Form	: -
Fuel material	: -
Refuelling type	: -
Moderator material	: -
Fuel clad material	: -
Fuel clad material specification	: -
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: -
Active core diameter [m]	: -
Active core height/length [m]	: -
Number of fissile fuel assemblies/bundles	: -
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: -
Fuel weight [t]	: -
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: -
Fuel clad thickness [mm]	: -
Average core power density [kW/dm <sup>3</sup> ]	: -
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: -
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Burnable neutron absorber material	: -
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: -
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

---

Number of external reactor coolant loops	: -
Coolant type	: -
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: -
Reactor outlet temperature [°C]	: -
Reactor inlet temperature [°C]	: -
Coolant mass flow at the rated power [t/h]	: -

### Steam generators (SG)/drum separators

---

Type of SG	: -
SG output	: -
Number of SG	: -
Number of drum separators	: -
Tube shape	: -
Tube material	: -
SG shell material	: -
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m <sup>2</sup> ]	: -

### Main coolant pumps/circulators

---

Total number of pumps/circulators	: -
Number of pumps per RCS loop	: -
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

---

Total volume [m <sup>3</sup> ]	: -
Number of safety valves	: -
Number of relief valves	: -
Installed heater power [kW]	: -

### Containment systems

---

Containment type	: -
Containment Shape	: -
Containment structure	: -
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m <sup>3</sup> ]	: -

---

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: -
Number of LPSI systems	: -
Number of hydroaccumulators	: -
Number of core spray system pumps (BWR)	: -
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: -

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: -

## Secondary systems

### Turbine

Turbine type	: -
Number of turbine-generators per unit/reactor	: -
Turbine speed [rpm]	: -
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: -
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: -
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: -
Number of condensers per turbine-generator	: -
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : -

Number of motor-driven main feedwater pumps : -

Number of start-up feed-water pumps (if different from the auxiliary FWP) : -

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : -

Number of diesel driven pumps : -

Number of turbine driven pumps : -

### Fire protection system

On-site fire suppression/extinguishing system : -

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : -

Number of alternate power sources from the transmission grid (standby transformers available per unit) : -

Number of on-site safety related diesel generators (available per unit) : -

Number of on-site safety related gas turbines (available per unit) : -

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : -

Interim storage facility type : -

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : -

Number of heat connection points per unit : -

Number of intermediate circuits/heat exchangers : -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



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NINGDE-1

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 16MND5
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: 308L+309L
Reactor vessel overall length/height [m]	: 13.208
Inside shell diameter [m]	: 3.989
Shell thickness [mm]	: 202
Number of pressure channels	: <Not Available>
Pressure channel material	: <Not Available>
Pressure channel wall thickness [mm]	: <Not Available>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: M5
Average fuel enrichment [% of U235]	: 2.43
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 44.6
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Available>
Fuel weight [t]	: 72.1
Moderator weight [t]	: 202
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 109
Average fuel power density [kW/kgU]	: 40.19
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 202
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.6
Reactor inlet temperature [°C]	: 292.4
Coolant mass flow at the rated power [t/h]	: 68520

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Available>
Tube shape	: U-tube
Tube material	: Inconel-690
SG shell material	: <Not Available>
Drum separator shell material	: <Not Available>
Design thermal capacity per SG [MW]	: 969
Design heat transfer surface [m <sup>2</sup> ]	: 5429

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.95
Design pressure difference [MPa]	: 1.73

### Pressurizer

Total volume [m <sup>3</sup> ]	: 39.75
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 500

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 49400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.52
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 17.67
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 850

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Available>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.43
HP cylinder Inlet steam moisture [%]	: 0.46
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1613

### Main generator

Rated active power [MWe]	: 1150
Rated apparent power [MVA]	: 1278
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.78

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 6
Steam generator feedwater inlet temperature [°C]	: 226

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 3
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: <Not Available>
Number of on site non-safety related gas turbines	: <Not Available>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 12.2
Total battery capacity [Ah]	: 34330

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1206
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: -
Number of heat connection points per unit	: -
Number of intermediate circuits/heat exchangers	: -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 16MND5
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: 308L+309L
Reactor vessel overall length/height [m]	: 13.208
Inside shell diameter [m]	: 3.989
Shell thickness [mm]	: 202
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: M5
Average fuel enrichment [% of U235]	: 2.43
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 44.6
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.1
Moderator weight [t]	: 202
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 109
Average fuel power density [kW/kgU]	: 40.19
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: gd203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 202
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.6
Reactor inlet temperature [°C]	: 292.4
Coolant mass flow at the rated power [t/h]	: 68520

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Inconel-690
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 969
Design heat transfer surface [m2]	: 5429

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.95
Design pressure difference [MPa]	: 1.73

### Pressurizer

Total volume [m3]	: 39.75
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 500

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 49400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.52
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 17.67
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 850

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.43
HP cylinder Inlet steam moisture [%]	: 0.46
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1613

### Main generator

Rated active power [MWe]	: 1150
Rated apparent power [MVA]	: 1278
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3



Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.78

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 6
Steam generator feedwater inlet temperature [°C]	: 226

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 3
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 12.2
Total battery capacity [Ah]	: 34330

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1206
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: -
Number of heat connection points per unit	: -
Number of intermediate circuits/heat exchangers	: -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: 16MND5
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 308L
Reactor vessel overall length/height [m]	: 12.978
Inside shell diameter [m]	: 3.84
Shell thickness [mm]	: 205
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.25
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: -
Active core diameter [m]	: 2.67
Active core height/length [m]	: 3.6576
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 63.283
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 94.30
Average fuel power density [kW/kgU]	: 34.71
Fuel linear heat generation rate [kW/m]	: 16.09

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 160
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 315.2
Reactor inlet temperature [°C]	: 288.8
Coolant mass flow at the rated power [t/h]	: 24290

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: -
Tube material	: INCOLOY-690
SG shell material	: SA-508
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 968
Design heat transfer surface [m2]	: 5630

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.236
Design pressure difference [MPa]	: 0.91

### Pressurizer

Total volume [m3]	: 27
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 50637

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.45
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17.67
LPSI system pressure [MPa]	: 1.00
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 680

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.41
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 279.9
HP cylinder Inlet steam flow rate [t/h]	: 3862

### Main generator

Rated active power [MWe]	: 650
Rated apparent power [MVA]	: 650
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 11.8

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.6
Steam generator feedwater inlet temperature [°C]	: 316

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Applicable>
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: <Not Applicable>
Total installed capacity of the on-site emergency power sources per unit [MW]	: <Not Applicable>
Total battery capacity [Ah]	: <Not Applicable>

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 690
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 16MND5
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 308L
Reactor vessel overall length/height [m]	: 12.978
Inside shell diameter [m]	: 3.84
Shell thickness [mm]	: 205
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.25
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: -
Active core diameter [m]	: 2.67
Active core height/length [m]	: 3.6576
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 63.283
Moderator weight [t]	: <Not Applicable>
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 94.30
Average fuel power density [kW/kgU]	: 34.71
Fuel linear heat generation rate [kW/m]	: 16.09

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 160
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 315.2
Reactor inlet temperature [°C]	: 288.8
Coolant mass flow at the rated power [t/h]	: 24000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-690
SG shell material	: SA-508
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 968
Design heat transfer surface [m2]	: 5630

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.236
Design pressure difference [MPa]	: 0.91

### Pressurizer

Total volume [m3]	: 27
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 50637

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.450
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17.67
LPSI system pressure [MPa]	: 1.00
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 680

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.41
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 279.9
HP cylinder Inlet steam flow rate [t/h]	: 3862

### Main generator

Rated active power [MWe]	: 650
Rated apparent power [MVA]	: 650
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 11.8

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.6
Steam generator feedwater inlet temperature [°C]	: 316

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: <Not Applicable>
Total installed capacity of the on-site emergency power sources per unit [MW]	: <Not Applicable>
Total battery capacity [Ah]	: <Not Applicable>

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 690
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: 16MND5
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 308L
Reactor vessel overall length/height [m]	: 12.978
Inside shell diameter [m]	: 3.84
Shell thickness [mm]	: 205
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.25
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: <Not Available>
Active core diameter [m]	: 2.67
Active core height/length [m]	: 3.6576
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 63.283
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 94.30
Average fuel power density [kW/kgU]	: 34.71
Fuel linear heat generation rate [kW/m]	: 16.09

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 160
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 315.2
Reactor inlet temperature [°C]	: 288.8
Coolant mass flow at the rated power [t/h]	: 24290

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	:
Tube material	: INCOLOY-690
SG shell material	: SA-508
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 968
Design heat transfer surface [m2]	: 5630

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.236
Design pressure difference [MPa]	: 0.91

### Pressurizer

Total volume [m3]	: 27
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 50637

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.45
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17.67
LPSI system pressure [MPa]	: 1.00
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 680

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.41
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 279.9
HP cylinder Inlet steam flow rate [t/h]	: 3862

### Main generator

Rated active power [MWe]	: 650
Rated apparent power [MVA]	: 650
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 11.8

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 3
Feedwater discharge pressure [MPa]	: 8.6
Steam generator feedwater inlet temperature [°C]	: 316

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Applicable>
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: <Not Applicable>
Total installed capacity of the on-site emergency power sources per unit [MW]	: <Not Applicable>
Total battery capacity [Ah]	: <Not Applicable>

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 690
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: -
Number of heat connection points per unit	: -
Number of intermediate circuits/heat exchangers	: -



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: 16MND5
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 308L
Reactor vessel overall length/height [m]	: 12.978
Inside shell diameter [m]	: 3.84
Shell thickness [mm]	: 205
Number of pressure channels	: <Not Available>
Pressure channel material	: <Not Available>
Pressure channel wall thickness [mm]	: <Not Available>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.25
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 50000
Active core diameter [m]	: 2.67
Active core height/length [m]	: 3.6576
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Available>
Fuel weight [t]	: 63.283
Moderator weight [t]	: 272
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 109.7
Average fuel power density [kW/kgU]	: 34.71
Fuel linear heat generation rate [kW/m]	: 16.09

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 160
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 315.2
Reactor inlet temperature [°C]	: 288.8
Coolant mass flow at the rated power [t/h]	: 24290

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Available>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: SA 508
Drum separator shell material	: <Not Available>
Design thermal capacity per SG [MW]	: 968
Design heat transfer surface [m2]	: 5630

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.236
Design pressure difference [MPa]	: 0.91

### Pressurizer

Total volume [m3]	: 27
Number of safety valves	: 3
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: 50637

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.45
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: 17.67
LPSI system pressure [MPa]	: 1
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 680

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Available>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.41
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 279.9
HP cylinder Inlet steam flow rate [t/h]	: 3862

### Main generator

Rated active power [MWe]	: 650
Rated apparent power [MVA]	: 650
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 11.8

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.6
Steam generator feedwater inlet temperature [°C]	: 316

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: <Not Available>
Number of on site non-safety related gas turbines	: <Not Available>
Other on-site emergency AC power sources	: <Not Available>
Estimated time reserve of the batteries at full load [h]	: <Not Available>
Total installed capacity of the on-site emergency power sources per unit [MW]	: <Not Available>
Total battery capacity [Ah]	: <Not Available>

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 690
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Available>

### Non-electrical applications

Primary heat connection	: -
Number of heat connection points per unit	: -
Number of intermediate circuits/heat exchangers	: -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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QINSHAN 3-1

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7.8
Inside shell diameter [m]	: 7.6
Shell thickness [mm]	: 28.6
Number of pressure channels	: 380
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.2

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 0.71
Refuelling frequency [month]	: 60
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 7186
Active core diameter [m]	: 6.28
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 24.01
Moderator weight [t]	: 264
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.4
Average core power density [kW/dm <sup>3</sup> ]	: <Not Available>
Average fuel power density [kW/kgU]	: 23.5
Fuel linear heat generation rate [kW/m]	: 25.35

#### Reactivity control

Control rod material	: Other - Stainless Steel/ G
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Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: Nitrogen Injection
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 196
Operating coolant pressure [MPa]	: 9.89
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 260
Coolant mass flow at the rated power [t/h]	: 27720

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Inco-800
SG shell material	: CS
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Available>
Design heat transfer surface [m2]	: <Not Available>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.71
Design pressure difference [MPa]	: 1.83

### Pressurizer

Total volume [m3]	: 45.3
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Other - Dousing ;LAC
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 48654



Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.124
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: 0.72
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Available>

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: <Not Available>
Turbine speed [rpm]	: <Not Available>
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: -
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: <Not Available>
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 43440

Interim storage facility type : Dry

Interim storage facility capacity (number of spent fuel assemblies) : <Not Available>

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : 1

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: <Not Available>
Extraction steam pressure [MPa]	: 4.51

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7.8
Inside shell diameter [m]	: 7.6
Shell thickness [mm]	: 28.6
Number of pressure channels	: 380
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.2

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 0.71
Refuelling frequency [month]	: 60
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 7186
Active core diameter [m]	: 6.28
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 24.01
Moderator weight [t]	: 264
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.4
Average core power density [kW/dm <sup>3</sup> ]	: <Not Available>
Average fuel power density [kW/kgU]	: 23.5
Fuel linear heat generation rate [kW/m]	: 25.35

#### Reactivity control

Control rod material	: Other - Stainless Steel/ G
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Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: Nitrogen Injection
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 196
Operating coolant pressure [MPa]	: 9.89
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 260
Coolant mass flow at the rated power [t/h]	: 27720

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Inco-800
SG shell material	: CS
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Available>
Design heat transfer surface [m2]	: <Not Available>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.71
Design pressure difference [MPa]	: 1.83

### Pressurizer

Total volume [m3]	: 45.3
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Other - Dousing ;LAC
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 48654

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.124
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: 0.72
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 2
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.51
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 258
HP cylinder Inlet steam flow rate [t/h]	: 3568

### Main generator

Rated active power [MWe]	: 728
Rated apparent power [MVA]	: 817
Output voltage [kV]	: 22
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power	: 1
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.9

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 6.5
Steam generator feedwater inlet temperature [°C]	: 187

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 1
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: <Not Available>
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 0
Estimated time reserve of the batteries at full load [h]	: <Not Available>
Total installed capacity of the on-site emergency power sources per unit [MW]	: 1.280
Total battery capacity [Ah]	: <Not Applicable>

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 43440
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: 1
Number of intermediate circuits/heat exchangers	: <Not Available>

Total capacity of heat connections [MWt]	: <Not Available>
Extraction steam pressure [MPa]	: 4.51



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QINSHAN-1

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-111
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 308L
Reactor vessel overall length/height [m]	: 10.705
Inside shell diameter [m]	: 3.382
Shell thickness [mm]	: 175
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.4
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 2.486
Active core height/length [m]	: 2.9
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 40.746
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.7
Average core power density [kW/dm <sup>3</sup> ]	: 68.6
Average fuel power density [kW/kgU]	: 26.9
Fuel linear heat generation rate [kW/m]	: 13.5

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: GG-17
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 14.6
Operating coolant pressure [MPa]	: 15.2
Reactor outlet temperature [°C]	: 308.5
Reactor inlet temperature [°C]	: 281.5
Coolant mass flow at the rated power [t/h]	: 24000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	: S271
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 484
Design heat transfer surface [m <sup>2</sup> ]	: 3077

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.2
Design pressure difference [MPa]	: 0.74

### Pressurizer

Total volume [m <sup>3</sup> ]	: 35
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1350

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 49000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 2.65
Design leakage rate [% per day]	: 0.22
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 75
LPSI system flowrate [t/h]	: 450

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 268.1
HP cylinder Inlet steam flow rate [t/h]	: 1866

### Main generator

Rated active power [MWe]	: 310
Rated apparent power [MVA]	: 364.7
Output voltage [kV]	: 18
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 3.9

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.4
Steam generator feedwater inlet temperature [°C]	: 215

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: 1
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 0
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 2
Total battery capacity [Ah]	: 2000

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1026
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

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TIANWAN-1

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: <Not Applicable>
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: <Not Applicable>
Inside shell diameter [m]	: <Not Applicable>
Shell thickness [mm]	: <Not Applicable>
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: <Not Available>
Fuel clad material specification	: <Not Available>
Average fuel enrichment [% of U235]	: <Not Available>
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: <Not Available>
Average discharge burnup [MWd/t]	: <Not Available>
Active core diameter [m]	: <Not Available>
Active core height/length [m]	: <Not Available>
Number of fissile fuel assemblies/bundles	: <Not Available>
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Available>
Fuel weight [t]	: <Not Available>
Moderator weight [t]	: <Not Available>
Number of fuel elements per assembly/bundle	: <Not Available>
Fuel clad thickness [mm]	: <Not Available>
Average core power density [kW/dm <sup>3</sup> ]	: <Not Available>
Average fuel power density [kW/kgU]	: <Not Available>
Fuel linear heat generation rate [kW/m]	: <Not Available>

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: <Not Available>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: <Not Available>

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: <Not Available>
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: <Not Available>
Reactor inlet temperature [°C]	: <Not Available>
Coolant mass flow at the rated power [t/h]	: <Not Available>

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: <Not Available>
SG shell material	: <Not Available>
Drum separator shell material	: <Not Available>
Design thermal capacity per SG [MW]	: <Not Available>
Design heat transfer surface [m2]	: <Not Available>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: <Not Available>
Design pressure difference [MPa]	: <Not Available>

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: <Not Available>

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: <Not Available>

Number of containment spray pumps	: <Not Available>
Containment design pressure [MPa]	: 0.46
Design leakage rate [% per day]	: <Not Available>
Type of H2 recombiner	: <Not Available>

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: <Not Available>
LPSI system pressure [MPa]	: <Not Available>
HPSI system flowrate [t/h]	: <Not Available>
LPSI system flowrate [t/h]	: <Not Available>

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: <Not Available>
Turbine speed [rpm]	: <Not Available>
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 4
HP cylinder inlet steam pressure [MPa]	: 5.78
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 5373

### Main generator

Rated active power [MWe]	: <Not Available>
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	: 4



Number of main condensate pumps required for full power : 4

Condenser vacuum at the full power (absolute pressure) [kPa] : 8

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

CN-11

TIANWAN-2

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: E110
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	:
Average discharge burnup [MWd/t]	: 47500
Active core diameter [m]	:
Active core height/length [m]	:
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	:
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	:

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 103

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 57380.4

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: <Not Available>
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.46
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: <Not Available>
Turbine speed [rpm]	: <Not Available>
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 4
HP cylinder inlet steam pressure [MPa]	: 5.78
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 5373

### Main generator

Rated active power [MWe]	: <Not Available>
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power : 4

Condenser vacuum at the full power (absolute pressure) : 8  
[kPa]

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

CN-22

YANGJIANG-1

CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: <Not Available>
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: <Not Available>
Reactor vessel overall length/height [m]	: 13.208
Inside shell diameter [m]	: 3.
Shell thickness [mm]	: <Not Available>
Number of pressure channels	: <Not Available>
Pressure channel material	: <Not Available>
Pressure channel wall thickness [mm]	: <Not Available>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: <Not Available>
Average fuel enrichment [% of U235]	: 2.43
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 4.45
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.1
Moderator weight [t]	: 202
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.47
Average core power density [kW/dm <sup>3</sup> ]	: 109
Average fuel power density [kW/kgU]	: 40.19
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 202
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.6
Reactor inlet temperature [°C]	: 292.4
Coolant mass flow at the rated power [t/h]	: 68520

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Available>
Tube shape	: U-tube
Tube material	: inconel
SG shell material	: <Not Available>
Drum separator shell material	: <Not Available>
Design thermal capacity per SG [MW]	: 969
Design heat transfer surface [m2]	: 5429

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: <Not Applicable>
Design pressure difference [MPa]	: 1.73

### Pressurizer

Total volume [m3]	: 39.75
Number of safety valves	: 6
Number of relief valves	: <Not Available>
Installed heater power [kW]	: <Not Available>

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 49400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.52
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: <Not Available>
LPSI system pressure [MPa]	: <Not Available>
HPSI system flowrate [t/h]	: <Not Available>
LPSI system flowrate [t/h]	: <Not Available>

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.43
HP cylinder Inlet steam moisture [%]	: 0.47
HP cylinder inlet steam temperature [°C]	: 280.14
HP cylinder Inlet steam flow rate [t/h]	: 1613

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1222.2
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.78

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: <Not Available>
Steam generator feedwater inlet temperature [°C]	: 226

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	: <Not Available>
Cable segregation within the unit used for	: <Not Available>
On-site fire brigade	: <Not Available>
Off-site fire brigade response time	: <Not Available>

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 3
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: 1
Other on-site emergency AC power sources	: <Not Available>
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 12.2
Total battery capacity [Ah]	: 32220

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Available>

### Non-electrical applications

Primary heat connection	: -
Number of heat connection points per unit	: -
Number of intermediate circuits/heat exchangers	: -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

CZ-4

DUKOVANY-1

CZECH REPUBLIC

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zr+1%Nb
Average fuel enrichment [% of U235]	: 4.3
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 84.4
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron SS
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: 240
Operating coolant pressure [MPa]	: 12.26
Reactor outlet temperature [°C]	: 297
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 31870

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.6
Design pressure difference [MPa]	: 0.425

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser

Total containment volume [m3]	: 51322
Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 13
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.7
LPSI system pressure [MPa]	: 0.71
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 280

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.3
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 256
HP cylinder Inlet steam flow rate [t/h]	: 1356

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: 250
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium

Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 7

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 5
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 6.6
Steam generator feedwater inlet temperature [°C]	: 223

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 4
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 8.4
Total battery capacity [Ah]	: 1500

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1049
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: 4053

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>



Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zr+1%Nb
Average fuel enrichment [% of U235]	: 4.3
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 84.4
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: 240
Operating coolant pressure [MPa]	: 12.26
Reactor outlet temperature [°C]	: 297
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 31870

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.6
Design pressure difference [MPa]	: 0.425

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 51322

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 13
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.7
LPSI system pressure [MPa]	: 0.71
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 280

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.3
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 256
HP cylinder Inlet steam flow rate [t/h]	: 1356

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: 250
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 7

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : <Not Applicable>

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.4

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1049

Interim storage facility type : Dry

Interim storage facility capacity (number of spent fuel assemblies) : 4053

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zr+1%Nb
Average fuel enrichment [% of U235]	: 4.3
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 84.8
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: 240
Operating coolant pressure [MPa]	: 12.26
Reactor outlet temperature [°C]	: 297
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 31870

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.6
Design pressure difference [MPa]	: 0.425

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 51322



Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 13
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.7
LPSI system pressure [MPa]	: 0.71
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 280

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.3
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 256
HP cylinder Inlet steam flow rate [t/h]	: 1356

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: 250
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 7

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : <Not Applicable>

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.4

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1049

Interim storage facility type : Dry

Interim storage facility capacity (number of spent fuel assemblies) : 4053

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zr+1%Nb
Average fuel enrichment [% of U235]	: 4.3
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 84.4
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: 240
Operating coolant pressure [MPa]	: 12.26
Reactor outlet temperature [°C]	: 297
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 31870

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.6
Design pressure difference [MPa]	: 0.425

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 51322

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 13
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.7
LPSI system pressure [MPa]	: 0.71
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 280

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.3
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 256
HP cylinder Inlet steam flow rate [t/h]	: 1356

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: 250
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 7

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : <Not Applicable>

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.4

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1049

Interim storage facility type : Dry

Interim storage facility capacity (number of spent fuel assemblies) : 4053

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRCALLOY-4
Average fuel enrichment [% of U235]	: 3.6
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25.7
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.63
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 91.75
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 105.5
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 16.3

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al <sub>2</sub> O <sub>3</sub> -B <sub>4</sub> C
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 330
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 318
Reactor inlet temperature [°C]	: 288
Coolant mass flow at the rated power [t/h]	: 64483

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 750
Design heat transfer surface [m <sup>2</sup> ]	: 6111

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 6.8
Design pressure difference [MPa]	: 0.67

### Pressurizer

Total volume [m <sup>3</sup> ]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 60000

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.46
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 6
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 11.4
LPSI system pressure [MPa]	: 2.26
HPSI system flowrate [t/h]	: 50
LPSI system flowrate [t/h]	: 800

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.2
HP cylinder Inlet steam moisture [%]	: 0.2
HP cylinder inlet steam temperature [°C]	: 278
HP cylinder Inlet steam flow rate [t/h]	: 5877

### Main generator

Rated active power [MWe]	: 1125
Rated apparent power [MVA]	: 1200
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power : 3

Condenser vacuum at the full power (absolute pressure) [kPa] : 7

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRCALLOY-4
Average fuel enrichment [% of U235]	: 3.6
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25.7
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.63
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 91.75
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 105.5
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 16.3

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al <sub>2</sub> O <sub>3</sub> -B <sub>4</sub> C
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 330
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 318
Reactor inlet temperature [°C]	: 288
Coolant mass flow at the rated power [t/h]	: 64483

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 750
Design heat transfer surface [m <sup>2</sup> ]	: 6111

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 6.8
Design pressure difference [MPa]	: 0.67

### Pressurizer

Total volume [m <sup>3</sup> ]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 60000

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.46
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 6
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 11.4
LPSI system pressure [MPa]	: 2.26
HPSI system flowrate [t/h]	: 50
LPSI system flowrate [t/h]	: 800

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.2
HP cylinder Inlet steam moisture [%]	: 0.2
HP cylinder inlet steam temperature [°C]	: 278
HP cylinder Inlet steam flow rate [t/h]	: 5877

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: 1200
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 4



Number of main condensate pumps required for full power : 3

Condenser vacuum at the full power (absolute pressure) [kPa] : 7

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : dry

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 23Ni,13Cr - 1 layer, 19Ni,9Cr - 3 other layers
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB
Average fuel enrichment [% of U235]	: 4.3
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 2.73
Active core height/length [m]	: 2.42
Number of fissile fuel assemblies/bundles	: 313
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 39,2
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 105.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 15.6

#### Reactivity control

Control rod material	: Boron SS
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: 180
Operating coolant pressure [MPa]	: 12.25
Reactor outlet temperature [°C]	: 301
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 30600

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2510

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.2
Design pressure difference [MPa]	: 0.43

### Pressurizer

Total volume [m3]	: 37.7
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Ice Condenser

Total containment volume [m3]	: 74700
Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.07
Design leakage rate [% per day]	: 0.2
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.5
LPSI system pressure [MPa]	: 1.1
HPSI system flowrate [t/h]	: 374
LPSI system flowrate [t/h]	: 1584

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	: 0.2
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	: 1422

### Main generator

Rated active power [MWe]	: 260
Rated apparent power [MVA]	: 288
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium

Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 2.5

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 5
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 6.9
Steam generator feedwater inlet temperature [°C]	: 227

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: 2
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 4
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 8.4
Total battery capacity [Ah]	: 1500

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 485
Interim storage facility type	: Other - N/A
Interim storage facility capacity (number of spent fuel assemblies)	:

**Non-electrical applications**

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 1

Number of intermediate circuits/heat exchangers	: 2
Total capacity of heat connections [MWt]	:
Extraction steam pressure [MPa]	: 0.7

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 23Ni,13Cr - 1 layer, 19Ni,9Cr - 3 other layers
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB
Average fuel enrichment [% of U235]	: 4.3
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 2.73
Active core height/length [m]	: 2.42
Number of fissile fuel assemblies/bundles	: 313
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 39,2
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 105.6
Average fuel power density [kW/kgU]	: 40.2
Fuel linear heat generation rate [kW/m]	: 15.7

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: 180
Operating coolant pressure [MPa]	: 12.25
Reactor outlet temperature [°C]	: 300
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 31900

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2510

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.2
Design pressure difference [MPa]	: 0.43

### Pressurizer

Total volume [m3]	: 37.7
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Ice Condenser
Total containment volume [m3]	: 74700

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.07
Design leakage rate [% per day]	: 0.2
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.5
LPSI system pressure [MPa]	: 1.1
HPSI system flowrate [t/h]	: 374
LPSI system flowrate [t/h]	: 1584

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	: 0.2
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	: 1422

### Main generator

Rated active power [MWe]	: 260
Rated apparent power [MVA]	: 288
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 2.5

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 5
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 6.9
Steam generator feedwater inlet temperature [°C]	: 227

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 4
Number of diesel driven pumps	: 2
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 4
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 8.4
Total battery capacity [Ah]	: 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 485
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 4618

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASME-533-B/508-CL-2
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 20.6
Inside shell diameter [m]	: 5.54
Shell thickness [mm]	: 139
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.85
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 47000
Active core diameter [m]	: 3.88
Active core height/length [m]	: 3.68
Number of fissile fuel assemblies/bundles	: 500
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 87.0
Moderator weight [t]	: <Not Applicable>
Number of fuel elements per assembly/bundle	: 91
Fuel clad thickness [mm]	: 0.6
Average core power density [kW/dm <sup>3</sup> ]	: 57.5
Average fuel power density [kW/kgU]	: 28.9
Fuel linear heat generation rate [kW/m]	: 16.3

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 121

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: <Not Applicable>
Operating coolant pressure [MPa]	: 7.12
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 274
Coolant mass flow at the rated power [t/h]	: 28000

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 0.62
Design pressure difference [MPa]	: 0.19

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 10290

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 4.8
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 4
HPSI systems pressure [MPa]	: 8.5
LPSI system pressure [MPa]	: 1.0
HPSI system flowrate [t/h]	: 81
LPSI system flowrate [t/h]	: 468

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 4
HP cylinder inlet steam pressure [MPa]	: 6.7
HP cylinder Inlet steam moisture [%]	: 0.01
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 980

### Main generator

Rated active power [MWe]	: 990
Rated apparent power [MVA]	: 1100
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power : 3

Condenser vacuum at the full power (absolute pressure) [kPa] : 4

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 4

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 8.2

Steam generator feedwater inlet temperature [°C] : 184

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : <Not Applicable>

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 4

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : <Not Applicable>

Estimated time reserve of the batteries at full load [h] : 5

Total installed capacity of the on-site emergency power sources per unit [MW] : 8

Total battery capacity [Ah] : 22000

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1520

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 4143

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>



Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASME-533-B/508-CL-2
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 20.6
Inside shell diameter [m]	: 5.54
Shell thickness [mm]	: 139
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.66
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 21
Average discharge burnup [MWd/t]	: 45500
Active core diameter [m]	: 4.00
Active core height/length [m]	: 3.68
Number of fissile fuel assemblies/bundles	: 500
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 87
Moderator weight [t]	: <Not Applicable>
Number of fuel elements per assembly/bundle	: 96
Fuel clad thickness [mm]	: 0.605
Average core power density [kW/dm <sup>3</sup> ]	: 57.5
Average fuel power density [kW/kgU]	: 28.9
Fuel linear heat generation rate [kW/m]	: 15.0

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 121

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: <Not Applicable>
Operating coolant pressure [MPa]	: 7.12
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 274
Coolant mass flow at the rated power [t/h]	: 28000

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 0.62
Design pressure difference [MPa]	: 0.19

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 10290

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 4.8
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 4
HPSI systems pressure [MPa]	: 8.5
LPSI system pressure [MPa]	: 1.0
HPSI system flowrate [t/h]	: 81
LPSI system flowrate [t/h]	: 468

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 4
HP cylinder inlet steam pressure [MPa]	: 6.7
HP cylinder Inlet steam moisture [%]	: 0.30
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 980

### Main generator

Rated active power [MWe]	: 990
Rated apparent power [MVA]	: 1100
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power : 3

Condenser vacuum at the full power (absolute pressure) [kPa] : 4

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 4

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 3

Feedwater discharge pressure [MPa] : 8.5

Steam generator feedwater inlet temperature [°C] : 184

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : <Not Applicable>

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 4

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : <Not Applicable>

Estimated time reserve of the batteries at full load [h] : 5

Total installed capacity of the on-site emergency power sources per unit [MW] : 8

Total battery capacity [Ah] : 22000

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1560

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 4143

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

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BELLEVILLE-1

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.25
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.2
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.5

#### Reactivity control

Control rod material	: Carbon Steel
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 51

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	:
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>



Total containment volume [m3]	:
Number of containment spray pumps	:
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7855

### Main generator

Rated active power [MWe]	: 1321
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -

Number of main condensate pumps	: -
Number of main condensate pumps required for full power	: -
Condenser vacuum at the full power (absolute pressure) [kPa]	: -

#### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	: -
Feedwater discharge pressure [MPa]	: -
Steam generator feedwater inlet temperature [°C]	: -

#### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

#### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: -
Number of on site non-safety related gas turbines	: -
Other on-site emergency AC power sources	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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BELLEVILLE-2

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.25
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.5

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.2
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7855

### Main generator

Rated active power [MWe]	: 1321
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 50000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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BLAYAIS-2

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.44
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 50000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.44
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 50000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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BLAYAIS-4

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.44
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 50000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.46
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15892

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5500

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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BUGEY-3

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.46
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15892

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5500

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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BUGEY-4

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
----------------------	-----------------

Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15892

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 5500

### Main generator

Rated active power [MWe]	: 933
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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BUGEY-5

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: FS ALLOYED WITH MN-MO-NI
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
----------------------	-----------------

Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15892

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 5500

### Main generator

Rated active power [MWe]	: 933
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



FR-50

CATTENOM-1

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95.8
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 323.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 7060

### Main generator

Rated active power [MWe]	: 1321
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95.8
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 7060

### Main generator

Rated active power [MWe]	: 1321
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

FR-60

CATTENOM-3

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95.8
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 7060

### Main generator

Rated active power [MWe]	: 1321
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95.8
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 7060

### Main generator

Rated active power [MWe]	: 1321
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

FR-40

CHINON B-1

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.32
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 38

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 22500

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5455

### Main generator

Rated active power [MWe]	: 924
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>



Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

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CHINON B-2

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.32
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 38

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 22500

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5455

### Main generator

Rated active power [MWe]	: 924
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.32
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 38

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 22500

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5455

### Main generator

Rated active power [MWe]	: 1040
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.32
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
----------------------	-----------------

Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 38

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 22500

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5455

### Main generator

Rated active power [MWe]	: 1040
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 16 MNO5
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: INOX 24/12
Reactor vessel overall length/height [m]	: 12.6
Inside shell diameter [m]	: 4.5
Shell thickness [mm]	: 225
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO2
Refuelling type	: OFF-line
Moderator material	: H2O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 39000
Active core diameter [m]	: 3.47
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 205
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 125
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 274
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm3]	: 105.2
Average fuel power density [kW/kgU]	: 34
Fuel linear heat generation rate [kW/m]	: 17.92

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORATE GLASS
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 329.5
Reactor inlet temperature [°C]	: 292.2
Coolant mass flow at the rated power [t/h]	: 69840

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.3
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 7.1
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 287
HP cylinder Inlet steam flow rate [t/h]	: 8650

### Main generator

Rated active power [MWe]	: 1450
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 16 MNO5
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: INOX 24/12
Reactor vessel overall length/height [m]	: 12.6
Inside shell diameter [m]	: 4.5
Shell thickness [mm]	: 225
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO2
Refuelling type	: OFF-line
Moderator material	: H2O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 39000
Active core diameter [m]	: 3.47
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 205
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 125
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm3]	: 105.2
Average fuel power density [kW/kgU]	: 34
Fuel linear heat generation rate [kW/m]	: 17.92

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORATE GLASS
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 329.5
Reactor inlet temperature [°C]	: 292.2
Coolant mass flow at the rated power [t/h]	: 69840

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.3
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 7.1
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 287
HP cylinder Inlet steam flow rate [t/h]	: 8650

### Main generator

Rated active power [MWe]	: 1450
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: INOX 24/12
Reactor vessel overall length/height [m]	: 12.6
Inside shell diameter [m]	: 4.5
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 35000
Active core diameter [m]	: 3.47
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 205
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 125
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 274
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: -
Average fuel power density [kW/kgU]	: 34
Fuel linear heat generation rate [kW/m]	: 17

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 329.5
Reactor inlet temperature [°C]	: 292.2
Coolant mass flow at the rated power [t/h]	: 2350

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.3
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 7.1
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 287
HP cylinder Inlet steam flow rate [t/h]	: 8650

### Main generator

Rated active power [MWe]	: 1450
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.6
Inside shell diameter [m]	: 4.5
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 35000
Active core diameter [m]	: 3.47
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 205
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 125
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 274
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: -
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 17

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 329.5
Reactor inlet temperature [°C]	: 292.2
Coolant mass flow at the rated power [t/h]	: 2350

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.3
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 7.1
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 287
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 1450
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5455

### Main generator

Rated active power [MWe]	: 928
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5455

### Main generator

Rated active power [MWe]	: 963
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5455

### Main generator

Rated active power [MWe]	: 963
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5455

### Main generator

Rated active power [MWe]	: 928
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



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DAMPIERRE-1

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600S
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 942
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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DAMPIERRE-2

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
----------------------	-----------------

Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600S
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 942
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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DAMPIERRE-3

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600S
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 942
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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DAMPIERRE-4

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
----------------------	-----------------



Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600S
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.61
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 942
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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FESSENHEIM-1

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 14
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.46
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 60300

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.257
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267
HP cylinder Inlet steam flow rate [t/h]	: 5500

### Main generator

Rated active power [MWe]	: 923
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.46
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 332
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 60300

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.257
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267
HP cylinder Inlet steam flow rate [t/h]	: 5500

### Main generator

Rated active power [MWe]	: 923
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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FLAMANVILLE-1

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7060

### Main generator

Rated active power [MWe]	: 1335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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FLAMANVILLE-2

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 255.3
HP cylinder Inlet steam flow rate [t/h]	: 7772

### Main generator

Rated active power [MWe]	: 1335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



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GOLFECH-1

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95.8
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.5

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7855

### Main generator

Rated active power [MWe]	: 1321
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95.8
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.5

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7855

### Main generator

Rated active power [MWe]	: 1321
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-503-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-503-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 289.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-503-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.3
Inside shell diameter [m]	: 3.987
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82.2
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 45

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.2
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 47700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.5
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-503-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.3
Inside shell diameter [m]	: 3.987
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82.2
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 45

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.2
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 47700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.5
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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GRAVELINES-5

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-503-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 47000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.85

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 36

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15890

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-503-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 47000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.85

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 36

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15890

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



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NOGENT-1

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 13.6
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 111.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95.8
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.5

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 293.4
Coolant mass flow at the rated power [t/h]	: 16700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.05
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7855

### Main generator

Rated active power [MWe]	: 1321
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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NOGENT-2

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 13.6
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 111.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95.8
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.5

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 293.4
Coolant mass flow at the rated power [t/h]	: 16700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7855

### Main generator

Rated active power [MWe]	: 1321
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 91000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.2
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7772

### Main generator

Rated active power [MWe]	: 1335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 91000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.2
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7772

### Main generator

Rated active power [MWe]	: 1335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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PALUEL-3

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 91000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.2
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7772

### Main generator

Rated active power [MWe]	: 1335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 36

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 91000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.2
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7772

### Main generator

Rated active power [MWe]	: 1335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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PENLY-1

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95.8
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 7855

### Main generator

Rated active power [MWe]	: 1335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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PENLY-2

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 804
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95.8
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 292.8
Coolant mass flow at the rated power [t/h]	: 16420

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 7855

### Main generator

Rated active power [MWe]	: 1335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.7
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 328.3
Reactor inlet temperature [°C]	: 293.1
Coolant mass flow at the rated power [t/h]	: 65600

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 7772

### Main generator

Rated active power [MWe]	: 1335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.6
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.267
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.7
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 36.68
Fuel linear heat generation rate [kW/m]	: 17.2

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 328.3
Reactor inlet temperature [°C]	: 293.1
Coolant mass flow at the rated power [t/h]	: 65600

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.1
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 7772

### Main generator

Rated active power [MWe]	: 1335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 928
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5455

### Main generator

Rated active power [MWe]	: 928
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 42000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 45

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 45

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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TRICASTIN-3

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 45

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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TRICASTIN-4

FRANCE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 4.003
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 33735
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 45

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 15894

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269.9
HP cylinder Inlet steam flow rate [t/h]	: 5450

### Main generator

Rated active power [MWe]	: 957
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



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BROKDORF

GERMANY

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 22-NiMoCr-37
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: 10-CR-NI-NB-189 (1.4550)
Reactor vessel overall length/height [m]	: 12.670
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 256
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.2
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 71
Average discharge burnup [MWd/t]	: 34000
Active core diameter [m]	: 3.6
Active core height/length [m]	: 3.9
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.725
Average core power density [kW/dm <sup>3</sup> ]	: 93
Average fuel power density [kW/kgU]	: 36.4
Fuel linear heat generation rate [kW/m]	: 20.8

#### Reactivity control

Control rod material	: Cadmium Alloy
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: In, AG, Cd
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 63619

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 946
Design heat transfer surface [m2]	: 5400

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 65
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 2142

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: Spray

Total containment volume [m3]	:
Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.63
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 8
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.7
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 1927

### Main generator

Rated active power [MWe]	: 1383
Rated apparent power [MVA]	: 1640
Output voltage [kV]	: 27
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>

Number of main condensate pumps	:
Number of main condensate pumps required for full power	:
Condenser vacuum at the full power (absolute pressure) [kPa]	:

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	:
Feedwater discharge pressure [MPa]	:
Steam generator feedwater inlet temperature [°C]	:

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	:
Cable segregation within the unit used for	:
On-site fire brigade	:
Off-site fire brigade response time	:

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	:
Total installed capacity of the on-site emergency power sources per unit [MW]	:
Total battery capacity [Ah]	:

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 768
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: 1900

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	:
Extraction steam pressure [MPa]	:

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EMSLAND

GERMANY

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 20-MNMONI-55; 22-NiMoCr-37
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: 10-CR-NI-NB-18.9
Reactor vessel overall length/height [m]	: 12.3
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 256
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.2
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 32000
Active core diameter [m]	: 3.6
Active core height/length [m]	: 3.9
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 300
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 93.0
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 16.4

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 63619

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 946
Design heat transfer surface [m2]	: 5400

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 65
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 2142

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: Spray
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.62
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 8
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.05
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 277
HP cylinder Inlet steam flow rate [t/h]	: 6958.8

### Main generator

Rated active power [MWe]	: 1314
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:



Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation :

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 768

Interim storage facility type : Dry

Interim storage facility capacity (number of spent fuel assemblies) : 2470

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 22-NiMoCr-37
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.8
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 256
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.2
Refuelling frequency [month]	: 11
Part of the core refuelled [%]	: 28
Average discharge burnup [MWd/t]	: 34000
Active core diameter [m]	: 3.8
Active core height/length [m]	: 3.9
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.725
Average core power density [kW/dm <sup>3</sup> ]	: 93.0
Average fuel power density [kW/kgU]	: 36.53
Fuel linear heat generation rate [kW/m]	: 20.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 329
Reactor inlet temperature [°C]	: 293
Coolant mass flow at the rated power [t/h]	: 63619

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 946
Design heat transfer surface [m2]	: 5400

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 7.4
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 65
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: Spray
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.53
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 8
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.64
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 7400

### Main generator

Rated active power [MWe]	: 1345
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 35
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power	:	
Condenser vacuum at the full power (absolute pressure) [kPa]	:	8.8

### Feedwater system

Number of turbine driven main feedwater pumps	:	<Not Available>
Number of motor-driven main feedwater pumps	:	<Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	:	<Not Available>
Number of feedwater pumps required for full power operation	:	
Feedwater discharge pressure [MPa]	:	
Steam generator feedwater inlet temperature [°C]	:	

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	:	<Not Available>
Number of diesel driven pumps	:	<Not Available>
Number of turbine driven pumps	:	<Not Available>

### Fire protection system

On-site fire suppression/extinguishing system	:	<Not Available>
Fire retardant cable coating used for	:	
Cable segregation within the unit used for	:	
On-site fire brigade	:	
Off-site fire brigade response time	:	

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	:	<Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	:	<Not Available>
Number of on-site safety related diesel generators (available per unit)	:	<Not Available>
Number of on-site safety related gas turbines (available per unit)	:	<Not Available>
Number of on site non-safety related diesel generator	:	
Number of on site non-safety related gas turbines	:	
Other on-site emergency AC power sources	:	
Estimated time reserve of the batteries at full load [h]	:	
Total installed capacity of the on-site emergency power sources per unit [MW]	:	
Total battery capacity [Ah]	:	

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	:	715
Interim storage facility type	:	Dry
Interim storage facility capacity (number of spent fuel assemblies)	:	1672

### Non-electrical applications

Primary heat connection	:	<Not Applicable>
Number of heat connection points per unit	:	<Not Available>
Number of intermediate circuits/heat exchangers	:	<Not Available>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 22-NiMoCr-37
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 308L-309L
Reactor vessel overall length/height [m]	: 12.82
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 250
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4/DUPLEX
Average fuel enrichment [% of U235]	: 3.2
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 75
Average discharge burnup [MWd/t]	: 34000
Active core diameter [m]	: 3.6
Active core height/length [m]	: 3.9
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.5
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.725
Average core power density [kW/dm <sup>3</sup> ]	: 93.0
Average fuel power density [kW/kgU]	: 36.37
Fuel linear heat generation rate [kW/m]	: 21.2

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 325.3
Reactor inlet temperature [°C]	: 292.1
Coolant mass flow at the rated power [t/h]	: 72580

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-800
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 967
Design heat transfer surface [m2]	: 5400

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 7.350
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 2142

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: Spray
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.53
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 8
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 285.3
HP cylinder Inlet steam flow rate [t/h]	: 7488

### Main generator

Rated active power [MWe]	: 1360
Rated apparent power [MVA]	: 1640
Output voltage [kV]	: 27
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power	:	
Condenser vacuum at the full power (absolute pressure) [kPa]	:	4.6

### Feedwater system

Number of turbine driven main feedwater pumps	:	<Not Available>
Number of motor-driven main feedwater pumps	:	<Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	:	<Not Available>
Number of feedwater pumps required for full power operation	:	
Feedwater discharge pressure [MPa]	:	
Steam generator feedwater inlet temperature [°C]	:	

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	:	<Not Available>
Number of diesel driven pumps	:	<Not Available>
Number of turbine driven pumps	:	<Not Available>

### Fire protection system

On-site fire suppression/extinguishing system	:	<Not Available>
Fire retardant cable coating used for	:	
Cable segregation within the unit used for	:	
On-site fire brigade	:	
Off-site fire brigade response time	:	

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	:	<Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	:	<Not Available>
Number of on-site safety related diesel generators (available per unit)	:	<Not Available>
Number of on-site safety related gas turbines (available per unit)	:	<Not Available>
Number of on site non-safety related diesel generator	:	
Number of on site non-safety related gas turbines	:	
Other on-site emergency AC power sources	:	
Estimated time reserve of the batteries at full load [h]	:	
Total installed capacity of the on-site emergency power sources per unit [MW]	:	
Total battery capacity [Ah]	:	

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	:	768
Interim storage facility type	:	Dry
Interim storage facility capacity (number of spent fuel assemblies)	:	1900

### Non-electrical applications

Primary heat connection	:	<Not Applicable>
Number of heat connection points per unit	:	<Not Available>
Number of intermediate circuits/heat exchangers	:	<Not Available>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASTM-A-508-11; 22-NI-MO-CR-37 (1.6751)
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: GE- (1.4551), 5-CR-NI-NB-199 (1.4551)
Reactor vessel overall length/height [m]	: 22.35
Inside shell diameter [m]	: 6.62
Shell thickness [mm]	: 171
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 2.8
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 18
Average discharge burnup [MWd/t]	: 27500
Active core diameter [m]	: 4.818
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 784
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 136.6
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.605
Average core power density [kW/dm <sup>3</sup> ]	: 56.8
Average fuel power density [kW/kgU]	: 28.3
Fuel linear heat generation rate [kW/m]	: 20.4

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 193

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 277
Coolant mass flow at the rated power [t/h]	: 51480

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: Saturated Steam
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.35
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.58
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 6966

### Main generator

Rated active power [MWe]	: 1310
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 27
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation :

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 3210

Interim storage facility type : Dry

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASTM-A-508-11; 22-NI-MO-CR-37 (1.6751)
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: GE- (1.4551), 5-CR-NI-NB-199 (1.4551)
Reactor vessel overall length/height [m]	: 22.35
Inside shell diameter [m]	: 6.62
Shell thickness [mm]	: 171
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 2.8
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 27500
Active core diameter [m]	: 4.818
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 784
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 137.5
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.725
Average core power density [kW/dm <sup>3</sup> ]	: 56.8
Average fuel power density [kW/kgU]	: 28.3
Fuel linear heat generation rate [kW/m]	: 14.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 193

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 277
Coolant mass flow at the rated power [t/h]	: 51480

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: Saturated Steam
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: <Not Applicable>

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.58
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 6966

### Main generator

Rated active power [MWe]	: 1310
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 27
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation :

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 3210

Interim storage facility type : Dry

Interim storage facility capacity (number of spent fuel assemblies) : 9984

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 20-MNMONI-55; '22 NiMoCr 37
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.010
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 250
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.2
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 32000
Active core diameter [m]	: 3.6
Active core height/length [m]	: 3.9
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 300
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 93.0
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 16.4

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328
Reactor inlet temperature [°C]	: 293
Coolant mass flow at the rated power [t/h]	: 63619

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 946
Design heat transfer surface [m2]	: 5400

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 65
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 2142

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 72000



Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.52
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 8
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: 6.3
LPSI system pressure [MPa]	: 0.68
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.43
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 278
HP cylinder Inlet steam flow rate [t/h]	: 1850

### Main generator

Rated active power [MWe]	: 1370
Rated apparent power [MVA]	: 1640
Output voltage [kV]	: 35
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power	:
Condenser vacuum at the full power (absolute pressure) [kPa]	: 8.8

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	:
Feedwater discharge pressure [MPa]	:
Steam generator feedwater inlet temperature [°C]	:

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	:
Cable segregation within the unit used for	:
On-site fire brigade	:
Off-site fire brigade response time	:

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	:
Total installed capacity of the on-site emergency power sources per unit [MW]	:
Total battery capacity [Ah]	:

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 768
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>
Number of intermediate circuits/heat exchangers	: <Not Available>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 20-MNMONI-55
Vessel cladding material	: <Not Available>
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 12.4
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 256
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 2.0
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 23
Average discharge burnup [MWd/t]	: 46000
Active core diameter [m]	: 3.6
Active core height/length [m]	: 3.9
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 300
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 93
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 16.4

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 325.6
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 63619

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Available>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	:
Drum separator shell material	:
Design thermal capacity per SG [MW]	: 946
Design heat transfer surface [m2]	: 5400

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 65
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 2142

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 72000

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.52
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 8
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: 6.3
LPSI system pressure [MPa]	: 0.95
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.23
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 279.3
HP cylinder Inlet steam flow rate [t/h]	: 2045

### Main generator

Rated active power [MWe]	: 1316
Rated apparent power [MVA]	: 1640
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 1
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :  
 Condenser vacuum at the full power (absolute pressure) : 8.9  
 [kPa]

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>  
 Number of motor-driven main feedwater pumps : <Not Available>  
 Number of start-up feed-water pumps (if different from the : <Not Available>  
 auxiliary FWP)  
 Number of feedwater pumps required for full power :  
 operation  
 Feedwater discharge pressure [MPa] :  
 Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>  
 Number of diesel driven pumps : <Not Available>  
 Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>  
 Fire retardant cable coating used for :  
 Cable segregation within the unit used for :  
 On-site fire brigade :  
 Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring : <Not Available>  
 units (available per unit)  
 Number of alternate power sources from the transmission : <Not Available>  
 grid (standby transformers available per unit)  
 Number of on-site safety related diesel generators (available : <Not Available>  
 per unit)  
 Number of on-site safety related gas turbines (available per : <Not Available>  
 unit)  
 Number of on site non-safety related diesel generator :  
 Number of on site non-safety related gas turbines :  
 Other on-site emergency AC power sources :  
 Estimated time reserve of the batteries at full load [h] :  
 Total installed capacity of the on-site emergency power :  
 sources per unit [MW]  
 Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent : 768  
 fuel assemblies)  
 Interim storage facility type : Dry  
 Interim storage facility capacity (number of spent fuel : 2968  
 assemblies)

### Non-electrical applications

Primary heat connection : <Not Available>  
 Number of heat connection points per unit : <Not Available>  
 Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: NIMOCR-ST; 22 NiMoCr 37
Vessel cladding material	: <Not Available>
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 12.7
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 256
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.605
Active core height/length [m]	: 3.9
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.725
Average core power density [kW/dm <sup>3</sup> ]	: 93
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 20.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 63619

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 946
Design heat transfer surface [m2]	: 5400

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 65
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 2142

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 72000

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.52
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 8
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 6.3
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.13
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 2055

### Main generator

Rated active power [MWe]	: 1349
Rated apparent power [MVA]	: 1560
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power	:	
Condenser vacuum at the full power (absolute pressure) [kPa]	:	3.8

### Feedwater system

Number of turbine driven main feedwater pumps	:	3
Number of motor-driven main feedwater pumps	:	<Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	:	<Not Available>
Number of feedwater pumps required for full power operation	:	
Feedwater discharge pressure [MPa]	:	
Steam generator feedwater inlet temperature [°C]	:	

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	:	<Not Available>
Number of diesel driven pumps	:	<Not Available>
Number of turbine driven pumps	:	<Not Available>

### Fire protection system

On-site fire suppression/extinguishing system	:	<Not Available>
Fire retardant cable coating used for	:	
Cable segregation within the unit used for	:	
On-site fire brigade	:	
Off-site fire brigade response time	:	

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	:	<Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	:	<Not Available>
Number of on-site safety related diesel generators (available per unit)	:	<Not Available>
Number of on-site safety related gas turbines (available per unit)	:	<Not Available>
Number of on site non-safety related diesel generator	:	
Number of on site non-safety related gas turbines	:	
Other on-site emergency AC power sources	:	
Estimated time reserve of the batteries at full load [h]	:	
Total installed capacity of the on-site emergency power sources per unit [MW]	:	
Total battery capacity [Ah]	:	

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	:	768
Interim storage facility type	:	<Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	:	

### Non-electrical applications

Primary heat connection	:	<Not Applicable>
Number of heat connection points per unit	:	<Not Applicable>
Number of intermediate circuits/heat exchangers	:	<Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: 3.6
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 37000
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.42
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 41.9
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 85.2
Average fuel power density [kW/kgU]	: 32
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron SS
Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: 210
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 297
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39750

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08H18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.6
Design pressure difference [MPa]	: 0.425

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser

Total containment volume [m3]	: 51322
Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 14.6
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.7
LPSI system pressure [MPa]	: 0.71
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 280

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.2
HP cylinder Inlet steam moisture [%]	: 0.05
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	: 1467

### Main generator

Rated active power [MWe]	: 255
Rated apparent power [MVA]	: 265
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Stainles Steel



Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 3.5

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 5
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 7.8
Steam generator feedwater inlet temperature [°C]	: 223

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 3
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 3
Total installed capacity of the on-site emergency power sources per unit [MW]	: 4.8
Total battery capacity [Ah]	: 1200

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1052
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: 7200

**Non-electrical applications**

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 2

Number of intermediate circuits/heat exchangers	: 4
Total capacity of heat connections [MWt]	: 37
Extraction steam pressure [MPa]	: 0.5

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: 3.82
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 37000
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.42
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 41.9
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 85.2
Average fuel power density [kW/kgU]	: 32
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 297
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39450

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.6
Design pressure difference [MPa]	: 0.425

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 51322

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 14.7
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.7
LPSI system pressure [MPa]	: 0.71
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 280

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.315
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	: 1467

### Main generator

Rated active power [MWe]	: 255
Rated apparent power [MVA]	: 265
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Stainles Steel
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 3.5

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 5
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 6.6
Steam generator feedwater inlet temperature [°C]	: 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	: 3
Total installed capacity of the on-site emergency power sources per unit [MW]	: 4.8
Total battery capacity [Ah]	: 1200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1029
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 2
Number of intermediate circuits/heat exchangers	: 4

Total capacity of heat connections [MWt]	: 37
Extraction steam pressure [MPa]	: 0.5

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: 3.82
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 37000
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.42
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 41.9
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 85.2
Average fuel power density [kW/kgU]	: 32
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: 210
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 297
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 40600

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.6
Design pressure difference [MPa]	: 0.425

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 51322

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 14.7
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.7
LPSI system pressure [MPa]	: 0.71
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 280

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	: 1467

### Main generator

Rated active power [MWe]	: 230
Rated apparent power [MVA]	: 255
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Stainles Steel
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 3.5

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 5
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 6.6
Steam generator feedwater inlet temperature [°C]	: 223

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 3
Total installed capacity of the on-site emergency power sources per unit [MW]	: 6
Total battery capacity [Ah]	: 1200

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1029
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	:

**Non-electrical applications**

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 2
Number of intermediate circuits/heat exchangers	: 4

Total capacity of heat connections [MWt]	: 37
Extraction steam pressure [MPa]	: 0.5

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: 3.82
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 37000
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.42
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 41.9
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 85.2
Average fuel power density [kW/kgU]	: 32
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: 210
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 297
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 40300

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.4
Design pressure difference [MPa]	: 0.425

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 51322

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 14.7
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.7
LPSI system pressure [MPa]	: 0.71
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 280

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	: 1467

### Main generator

Rated active power [MWe]	: 230
Rated apparent power [MVA]	: 255
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Stainles Steel
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 3.5

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 5
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 6.6
Steam generator feedwater inlet temperature [°C]	: 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	: 3
Total installed capacity of the on-site emergency power sources per unit [MW]	: 4.8
Total battery capacity [Ah]	: 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1029
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 2
Number of intermediate circuits/heat exchangers	: 4



Total capacity of heat connections [MWt]	: 37
Extraction steam pressure [MPa]	: 0.5

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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.07
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: 25.4
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6700
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 10.07
Average fuel power density [kW/kgU]	: 17.7
Fuel linear heat generation rate [kW/m]	: 35.3

#### Reactivity control

Control rod material	: Boron SS
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 8.7
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 13210

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.73
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: 1330

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -

Number of main condensate pumps	: -
Number of main condensate pumps required for full power	: -
Condenser vacuum at the full power (absolute pressure) [kPa]	: -

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	: -
Feedwater discharge pressure [MPa]	: -
Steam generator feedwater inlet temperature [°C]	: -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: -
Number of on site non-safety related gas turbines	: -
Other on-site emergency AC power sources	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.07
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: 25.4
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U <sub>235</sub> ]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6700
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 10.07
Average fuel power density [kW/kgU]	: 17.7
Fuel linear heat generation rate [kW/m]	: 35.3

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 8.7
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 13210

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.73
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: 1330

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: -
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: <Not Available>
Fuel clad material	: <Not Available>
Fuel clad material specification	: -
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: -
Active core diameter [m]	: -
Active core height/length [m]	: -
Number of fissile fuel assemblies/bundles	: -
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: -
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: -
Fuel clad thickness [mm]	: -
Average core power density [kW/dm <sup>3</sup> ]	: -
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 1.5
Reactor outlet temperature [°C]	: -
Reactor inlet temperature [°C]	: -
Coolant mass flow at the rated power [t/h]	: -

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: <Not Available>
Number of drum separators	: <Not Applicable>
Tube shape	: -
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: <Not Available>
Number of pumps per RCS loop	: <Not Available>
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: <Not Available>
Turbine speed [rpm]	: <Not Available>
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: -
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: <Not Available>
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: -
Inside shell diameter [m]	: -
Shell thickness [mm]	: -
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: <Not Available>
Fuel clad material	: <Not Available>
Fuel clad material specification	: -
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: -
Active core diameter [m]	: -
Active core height/length [m]	: -
Number of fissile fuel assemblies/bundles	: -
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: -
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: -
Fuel clad thickness [mm]	: -
Average core power density [kW/dm <sup>3</sup> ]	: -
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 1.05
Reactor outlet temperature [°C]	: -
Reactor inlet temperature [°C]	: -
Coolant mass flow at the rated power [t/h]	: -

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: <Not Available>
Number of drum separators	: <Not Applicable>
Tube shape	: -
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: <Not Available>
Number of pumps per RCS loop	: <Not Available>
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: <Not Available>
Turbine speed [rpm]	: <Not Available>
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: -
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: <Not Available>
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.07
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: 25.4
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6500
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 10.07
Average fuel power density [kW/kgU]	: 17.7
Fuel linear heat generation rate [kW/m]	: 29.57

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: 0
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 8.7
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 13210

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.25
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: 1330

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.07
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: 25.4
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6500
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 10.07
Average fuel power density [kW/kgU]	: 17.7
Fuel linear heat generation rate [kW/m]	: 29.57

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: 0
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 8.7
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 13210

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.25
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: 1330

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 10
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 42000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 66
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 111
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2+PS 80
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 121

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 2.7
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 86000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5.6
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.07
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: 25.4
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6700
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 10.07
Average fuel power density [kW/kgU]	: 18.1
Fuel linear heat generation rate [kW/m]	: 35.3

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 8.5
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 12100

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: MONEL-400
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 8
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.16
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: 1336

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.07
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: 25.4
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6700
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 10.07
Average fuel power density [kW/kgU]	: 18.1
Fuel linear heat generation rate [kW/m]	: 35.3

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 8.5
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 12100

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: MONEL-400
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 8
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.16
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: 1336

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 4.645
Inside shell diameter [m]	: 5.996
Shell thickness [mm]	: 25
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 15000
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 10.07
Average fuel power density [kW/kgU]	: 18.1
Fuel linear heat generation rate [kW/m]	: 35.3

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 8.7
Reactor outlet temperature [°C]	: 293.4
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 12700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Available>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.25
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: 1336

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 4.645
Inside shell diameter [m]	: 5.996
Shell thickness [mm]	: 25
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 15000
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 10.07
Average fuel power density [kW/kgU]	: 18.1
Fuel linear heat generation rate [kW/m]	: 35.3

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 8.7
Reactor outlet temperature [°C]	: 293.4
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 12700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Available>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.25
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: 1336

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.07
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: 25.4
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6700
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 8.23
Average fuel power density [kW/kgU]	: 15.8
Fuel linear heat generation rate [kW/m]	: 35.3

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 11.6
Reactor outlet temperature [°C]	: 304
Reactor inlet temperature [°C]	: 260
Coolant mass flow at the rated power [t/h]	: 28135

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.44
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.1
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250.6
HP cylinder Inlet steam flow rate [t/h]	: 1073

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.07
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: 25.4
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6700
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 8.23
Average fuel power density [kW/kgU]	: 15.8
Fuel linear heat generation rate [kW/m]	: 35.3

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 11.6
Reactor outlet temperature [°C]	: 304
Reactor inlet temperature [°C]	: 260
Coolant mass flow at the rated power [t/h]	: 28282

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.44
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.1
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 253
HP cylinder Inlet steam flow rate [t/h]	: 1073

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.07
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: 25.4
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6700
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 10.07
Average fuel power density [kW/kgU]	: 17.7
Fuel linear heat generation rate [kW/m]	: 35.3

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 8.7
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 11800

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: MONEL-400
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 8
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: 1330

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.07
Inside shell diameter [m]	: 6.05
Shell thickness [mm]	: 25.4
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6700
Active core diameter [m]	: 4.5
Active core height/length [m]	: 5
Number of fissile fuel assemblies/bundles	: 3672
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.42
Average core power density [kW/dm <sup>3</sup> ]	: 10.07
Average fuel power density [kW/kgU]	: 17.7
Fuel linear heat generation rate [kW/m]	: 20.6

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 8.7
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 11800

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: MONEL-400
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 8
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: 1330

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.94
Inside shell diameter [m]	: 7.8
Shell thickness [mm]	: 32
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U <sup>235</sup> ]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 7000
Active core diameter [m]	: 6.38
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 5096
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: -
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 13
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 9.1
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 20.18

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD NO3
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 1.034
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 13210

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.73
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.94
Inside shell diameter [m]	: 7.8
Shell thickness [mm]	: 32
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 7000
Active core diameter [m]	: 6.38
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 5096
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: -
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 9.1
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 20.18

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD NO3
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 0.991
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 249
Coolant mass flow at the rated power [t/h]	: 13210

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.73
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.972
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-GRB-SS-CLAD
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-308
Reactor vessel overall length/height [m]	: 16.4
Inside shell diameter [m]	: 3.66
Shell thickness [mm]	: 123.8
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 2.44
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 21600
Active core diameter [m]	: 2.416
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 284
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 39.5
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 39.44
Average fuel power density [kW/kgU]	: 17.9
Fuel linear heat generation rate [kW/m]	: 14.2

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 69

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.03
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 13246

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:



Number of containment spray pumps	:
Containment design pressure [MPa]	: 3.06
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.879
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 904

### Main generator

Rated active power [MWe]	: 210
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-GRB-SS-CLAD
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-308
Reactor vessel overall length/height [m]	: 16.4
Inside shell diameter [m]	: 3.66
Shell thickness [mm]	: 123.8
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 2.44
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 21600
Active core diameter [m]	: 2.416
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 284
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 39.5
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 39.44
Average fuel power density [kW/kgU]	: 17.9
Fuel linear heat generation rate [kW/m]	: 14.2

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 69

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.03
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 13246

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 3.06
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.88
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 904

### Main generator

Rated active power [MWe]	: 210
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.94
Inside shell diameter [m]	: 7.8
Shell thickness [mm]	: 32
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 7000
Active core diameter [m]	: 6.38
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 5096
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 97.8
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 9.1
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 20.18

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD NO3
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 0.7
Reactor outlet temperature [°C]	: 304
Reactor inlet temperature [°C]	: 260
Coolant mass flow at the rated power [t/h]	: 28282

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.44
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.1
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250.6
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: SS-304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.94
Inside shell diameter [m]	: 7.8
Shell thickness [mm]	: 32
Number of pressure channels	: 306
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 7000
Active core diameter [m]	: 6.38
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 5096
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 97.8
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.41
Average core power density [kW/dm <sup>3</sup> ]	: 9.1
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 20.18

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD NO3
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 11.6
Reactor outlet temperature [°C]	: 304
Reactor inlet temperature [°C]	: 260
Coolant mass flow at the rated power [t/h]	: 28282

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Mushroom
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.44
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.1
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 250.6
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 11.18
Inside shell diameter [m]	: 4.13
Shell thickness [mm]	: 199.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	:
Average fuel enrichment [% of U235]	: 2.45
Refuelling frequency [month]	: 10
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 79.840
Moderator weight [t]	: 391
Number of fuel elements per assembly/bundle	: 311
Fuel clad thickness [mm]	: 0.685
Average core power density [kW/dm <sup>3</sup> ]	:
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 16.67

#### Reactivity control

Control rod material	: Boron Carbide
Burnable neutron absorber material	: Other - CrB2+Al
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 103

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: 391.6
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 84800

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN2MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 753
Design heat transfer surface [m2]	: 6115

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5
Design pressure difference [MPa]	: 0.588

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Available>

Total containment volume [m3]	: 91654
Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.46
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 12
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 5
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	: 200
LPSI system flowrate [t/h]	: 1102

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.88
HP cylinder Inlet steam moisture [%]	: 0.2
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 5980

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: 1176.47
Output voltage [kV]	: 27
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium

Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 7.55

#### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.6
Steam generator feedwater inlet temperature [°C]	: 220

#### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

#### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	:
Cable segregation within the unit used for	:
On-site fire brigade	:
Off-site fire brigade response time	:

#### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 8
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 24.9
Total battery capacity [Ah]	: 1500

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 639
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	:

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

JP-25

FUKUSHIMA-DAINI-1

JAPAN

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JISG-3120/SQV-2-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS and high Ni alloy steel
Reactor vessel overall length/height [m]	: 23
Inside shell diameter [m]	: 6.42
Shell thickness [mm]	: 157
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.70
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 133
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control



Control rod material	: Boron Carbide/Hafnium
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 6.7
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 5800
Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.28
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.6
LPSI system pressure [MPa]	: 0.92
HPSI system flowrate [t/h]	: 370
LPSI system flowrate [t/h]	: 1690

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium

Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5

#### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 6.8
Steam generator feedwater inlet temperature [°C]	:

#### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

#### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

#### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 3
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	:
Total installed capacity of the on-site emergency power sources per unit [MW]	:
Total battery capacity [Ah]	: 10100

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 2662
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JISG-3120/SQV-2-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS and high Ni alloy steel
Reactor vessel overall length/height [m]	: 22.9
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 158
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.70
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 133
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 8600

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.28
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.6
LPSI system pressure [MPa]	: 0.86
HPSI system flowrate [t/h]	: 370
LPSI system flowrate [t/h]	: 1690

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 6.9

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 3

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 10400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 2769

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JISG-3120/SQV-2-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS and high Ni alloy steel
Reactor vessel overall length/height [m]	: 23
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 157
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.68
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 133
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.70
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 8700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.28
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.6
LPSI system pressure [MPa]	: 0.92
HPSI system flowrate [t/h]	: 350
LPSI system flowrate [t/h]	: 1690

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.7

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 3

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 9900

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 2740

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JISG-3120/SQV-2-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS and high Ni alloy steel
Reactor vessel overall length/height [m]	: 22.9
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 158
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.68
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 133
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.70
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 8600



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.28
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.6
LPSI system pressure [MPa]	: 0.92
HPSI system flowrate [t/h]	: 350
LPSI system flowrate [t/h]	: 1690

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.4

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 3

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 10400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 2769

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-GR-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 11
Inside shell diameter [m]	: 3.4
Shell thickness [mm]	: 110
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 55000
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: 175
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 95
Average fuel power density [kW/kgU]	: 34.3
Fuel linear heat generation rate [kW/m]	: 20.4

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 175
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 288
Coolant mass flow at the rated power [t/h]	: 30000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: Alloyed Steel
Drum separator shell material	:
Design thermal capacity per SG [MW]	: 825
Design heat transfer surface [m2]	: 4870

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.7

### Pressurizer

Total volume [m3]	: 28.3
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 50600

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.24
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.5
LPSI system pressure [MPa]	: 0.7
HPSI system flowrate [t/h]	: 160
LPSI system flowrate [t/h]	: 454

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.41
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 270.1
HP cylinder Inlet steam flow rate [t/h]	: 3133

### Main generator

Rated active power [MWe]	: 559
Rated apparent power [MVA]	: 625
Output voltage [kV]	: 19
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.48

Steam generator feedwater inlet temperature [°C] : 291

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] : 7.2

Total battery capacity [Ah] : 3200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 324

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : Turbine Extraction

Number of heat connection points per unit : 2

Number of intermediate circuits/heat exchangers : 1

Total capacity of heat connections [MWt]	: 12
Extraction steam pressure [MPa]	: 2.57



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-GR-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 11
Inside shell diameter [m]	: 3.4
Shell thickness [mm]	: 110
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 55000
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	: 175
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 95
Average fuel power density [kW/kgU]	: 34.3
Fuel linear heat generation rate [kW/m]	: 20.4

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 175
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 288
Coolant mass flow at the rated power [t/h]	: 30000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: Alloyed Steel
Drum separator shell material	:
Design thermal capacity per SG [MW]	: 825
Design heat transfer surface [m2]	: 5060

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.7

### Pressurizer

Total volume [m3]	: 28.3
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 51000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.24
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.5
LPSI system pressure [MPa]	: 0.7
HPSI system flowrate [t/h]	: 160
LPSI system flowrate [t/h]	: 454

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.41
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 270.1
HP cylinder Inlet steam flow rate [t/h]	: 3133

### Main generator

Rated active power [MWe]	: 559
Rated apparent power [MVA]	: 625
Output voltage [kV]	: 19
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.48

Steam generator feedwater inlet temperature [°C] : 291

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] : 7.2

Total battery capacity [Ah] : 3200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 400

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : Turbine Extraction

Number of heat connection points per unit : 2

Number of intermediate circuits/heat exchangers : 1

Total capacity of heat connections [MWt]	: 12
Extraction steam pressure [MPa]	: 2.57

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SQV-2-A (JIS-G3120 + G3204)
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.9
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 135
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.1
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 46
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	: 351
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.9

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Boron
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: 351
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 60100

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: NI/CR/FE ALLOY
SG shell material	: Alloyed Steel SQV2B
Drum separator shell material	:
Design thermal capacity per SG [MW]	: 855.75
Design heat transfer surface [m2]	: 4870

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.7

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 73700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 9.4
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.76
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 273.9
HP cylinder Inlet steam flow rate [t/h]	: 6700

### Main generator

Rated active power [MWe]	: 1180
Rated apparent power [MVA]	: 1310
Output voltage [kV]	: 24
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3



Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 8.17

Steam generator feedwater inlet temperature [°C] : 298

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] : 14.2

Total battery capacity [Ah] : 3200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1050

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : Turbine Extraction

Number of heat connection points per unit : 2

Number of intermediate circuits/heat exchangers : 1

Total capacity of heat connections [MWt]	: 30
Extraction steam pressure [MPa]	: 2.66

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SQV-2-A (JIS-G3120 + G3204)
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.9
Inside shell diameter [m]	: 4.39
Shell thickness [mm]	: 135
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.1
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 46
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	: 351
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.9

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Boron
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: 351
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 60100

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: NI/CR/FE ALLOY
SG shell material	: Alloyed Steel SQV2B
Drum separator shell material	:
Design thermal capacity per SG [MW]	: 855.75
Design heat transfer surface [m2]	: 4870

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.7

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 73700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 9.4
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.76
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 273.9
HP cylinder Inlet steam flow rate [t/h]	: 6700

### Main generator

Rated active power [MWe]	: 1180
Rated apparent power [MVA]	: 1310
Output voltage [kV]	: 24
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) :  
[kPa]

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 8.17

Steam generator feedwater inlet temperature [°C] : 291

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] : 14.2

Total battery capacity [Ah] : 3200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1500

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : Turbine Extraction

Number of heat connection points per unit : 2

Number of intermediate circuits/heat exchangers : 1

Total capacity of heat connections [MWt]	: 30
Extraction steam pressure [MPa]	: 2.66

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SQV-2-A/SFW-3 (JIS G-3120 SQV2A)
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: ASME SFA-5.9 ER309 improved type
Reactor vessel overall length/height [m]	: 22.975
Inside shell diameter [m]	: 6.42
Shell thickness [mm]	: 156.7
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.0
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 29500
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 134
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 24.6
Fuel linear heat generation rate [kW/m]	: 18

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: <Not Applicable>
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 215.6
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.95
Design pressure difference [MPa]	: 2.36

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 8390

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.43
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.49
LPSI system pressure [MPa]	: 0.90
HPSI system flowrate [t/h]	: 368
LPSI system flowrate [t/h]	: 1691

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.55
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282.3
HP cylinder Inlet steam flow rate [t/h]	: 6377.43

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1280
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.1

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.06
Steam generator feedwater inlet temperature [°C]	:

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 16.6
Total battery capacity [Ah]	:

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 3134
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SQV-2-A/SFW-3(SQV2A SFVQ1A)
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 22.975
Inside shell diameter [m]	: 6.42
Shell thickness [mm]	: 156.7
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.44
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 39500
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 134
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 24.6
Fuel linear heat generation rate [kW/m]	: 18

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: <Not Applicable>
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 215.6
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.95
Design pressure difference [MPa]	: 2.36

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 8390

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.43
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.49
LPSI system pressure [MPa]	: 0.90
HPSI system flowrate [t/h]	: 368
LPSI system flowrate [t/h]	: 1691

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.55
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282.3
HP cylinder Inlet steam flow rate [t/h]	: 6072.467

### Main generator

Rated active power [MWe]	: 1137
Rated apparent power [MVA]	: 1280
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.1

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.06
Steam generator feedwater inlet temperature [°C]	:

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 16.2
Total battery capacity [Ah]	:

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 3120
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

JP-60

HAMAOKA-5

JAPAN

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: (SQV2A,SFVQ1A)
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS and high Ni alloy steel
Reactor vessel overall length/height [m]	: 22.081
Inside shell diameter [m]	: 7.12
Shell thickness [mm]	: 174
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.7
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 5.16
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 872
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 151
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50.6
Average fuel power density [kW/kgU]	: 26
Fuel linear heat generation rate [kW/m]	: 16.5

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: <Not Applicable>
Number of control rod assemblies	: 205

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 52200

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 10
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 0.83
Design pressure difference [MPa]	: 0.39

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 7350

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.4
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8.73
LPSI system pressure [MPa]	: 1.23
HPSI system flowrate [t/h]	: 182
LPSI system flowrate [t/h]	: 954

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.69
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 283.7
HP cylinder Inlet steam flow rate [t/h]	: 7268.156

### Main generator

Rated active power [MWe]	: 1380
Rated apparent power [MVA]	: 1570
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 7.326

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.06
Steam generator feedwater inlet temperature [°C]	:

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 16.5
Total battery capacity [Ah]	:

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 3696
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SQV2A SFVQ1A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS AND HIGH-NI-STEEL
Reactor vessel overall length/height [m]	: 22
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 160
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.7
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 132
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50.0
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 15.8

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD2O3
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Applicable>
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 6
Design pressure difference [MPa]	: 2.4

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 14100



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.43
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.4
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	: 370
LPSI system flowrate [t/h]	: 1700

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.55
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 6400

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1250
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 6

Number of main condensate pumps required for full power	: 4
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.7

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.1
Steam generator feedwater inlet temperature [°C]	: <Not Applicable>

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 16.16
Total battery capacity [Ah]	: 7400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 3300
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508/SFVQ1A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 11
Inside shell diameter [m]	: 3
Shell thickness [mm]	: 110
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zr-Sn-Fe-Cr-Nb/Zr-Sn-Fe-Cr-Nb-Ni/Zr-Sn-Fe-Nb
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 26
Average discharge burnup [MWd/t]	: 51000
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 95
Average fuel power density [kW/kgU]	: 33.6
Fuel linear heat generation rate [kW/m]	: 20.4

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub> /BOROSILICATE/B <sub>4</sub> C
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 288
Coolant mass flow at the rated power [t/h]	: 30300

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 825
Design heat transfer surface [m <sup>2</sup> ]	: 5060

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m <sup>3</sup> ]	: 28
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 40200

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.267
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.5
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 160
LPSI system flowrate [t/h]	: 454

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.4
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 3201

### Main generator

Rated active power [MWe]	: 566
Rated apparent power [MVA]	: 630
Output voltage [kV]	: 19
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Brass
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 6.7

Steam generator feedwater inlet temperature [°C] : 221

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Power source car

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] : 7.2

Total battery capacity [Ah] : 3200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 360

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508/SFVQ1A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 11
Inside shell diameter [m]	: 3
Shell thickness [mm]	: 110
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zr-Sn-Fe-Cr-Nb/Zr-Sn-Fe-Cr-Nb-Ni/Zr-Sn-Fe-Nb
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 26
Average discharge burnup [MWd/t]	: 51000
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 95
Average fuel power density [kW/kgU]	: 33.6
Fuel linear heat generation rate [kW/m]	: 20.4

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub> /BOROSILICATE/B <sub>4</sub> C
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 288
Coolant mass flow at the rated power [t/h]	: 30300

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 825
Design heat transfer surface [m <sup>2</sup> ]	: 5060

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m <sup>3</sup> ]	: 28
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 40200

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.267
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.5
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 160
LPSI system flowrate [t/h]	: 454

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.4
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 3201

### Main generator

Rated active power [MWe]	: 566
Rated apparent power [MVA]	: 630
Output voltage [kV]	: 19
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Brass
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 6.7

Steam generator feedwater inlet temperature [°C] : 221

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Power source car

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] : 7.2

Total battery capacity [Ah] : 3200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 444

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SFVQ1A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 126
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zr-Sn-Fe-Cr-Nb/Zr-Sn-Fe-Cr-Nb-Ni/Zr-Sn-Fe-Nb/Zr-4
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 31
Average discharge burnup [MWd/t]	: 49000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 74
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 100
Average fuel power density [kW/kgU]	: 35.8
Fuel linear heat generation rate [kW/m]	: 17.1

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub> /BOROSILICATE/B <sub>4</sub> C
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 45700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 886.67
Design heat transfer surface [m <sup>2</sup> ]	: 4870

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m <sup>3</sup> ]	: 40
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 67400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.283
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 9.3
LPSI system pressure [MPa]	: 0.7
HPSI system flowrate [t/h]	: 280
LPSI system flowrate [t/h]	: 852

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.1
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 266
HP cylinder Inlet steam flow rate [t/h]	: 5130

### Main generator

Rated active power [MWe]	: 890
Rated apparent power [MVA]	: 990
Output voltage [kV]	: 23
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3



Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 5.5

Steam generator feedwater inlet temperature [°C] : 221

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Power source car

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] : 12.4

Total battery capacity [Ah] : 8000

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1805

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JISG-3120/SQV-2-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS AND HIGH-NI-STEEL
Reactor vessel overall length/height [m]	: 23
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.70
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 133
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 5700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.28
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.6
LPSI system pressure [MPa]	: 0.92
HPSI system flowrate [t/h]	: 350
LPSI system flowrate [t/h]	: 1690

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 6.7

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 6

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 10600

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 2790

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JISG-3120/SQV-2-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS and high Ni alloy steel
Reactor vessel overall length/height [m]	: 23
Inside shell diameter [m]	: 6.42
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.70
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 133
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 8700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.6
LPSI system pressure [MPa]	: 0.85
HPSI system flowrate [t/h]	: 350
LPSI system flowrate [t/h]	: 1690

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: <Not Applicable>
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 6

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 10400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 3239

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JISG-3120/SQV-2-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 23
Inside shell diameter [m]	: 6.42
Shell thickness [mm]	: 157
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.68
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 133
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.70
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 8700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.6
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	: 370
LPSI system flowrate [t/h]	: 1690

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: <Not Applicable>
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: <Not Applicable>
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 6

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 12000

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 3212

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JISG-3120/SQV-2-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 22
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 160
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.70
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 133
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 8700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.6
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	: 370
LPSI system flowrate [t/h]	: 1690

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: <Not Applicable>
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: <Not Applicable>
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 6

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 12000

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 3209

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JISG-3120/SQV-2-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS and high Ni alloy steel
Reactor vessel overall length/height [m]	: 22.9
Inside shell diameter [m]	: 6.43
Shell thickness [mm]	: 158
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.68
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 133
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.70
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 18.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 8700



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.6
LPSI system pressure [MPa]	: 0.85
HPSI system flowrate [t/h]	: 350
LPSI system flowrate [t/h]	: 1690

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: <Not Applicable>
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 6

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 10400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 3175

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	:
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21
Inside shell diameter [m]	: 7.1
Shell thickness [mm]	: 170
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.75
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 5.16
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 872
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 151
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.70
Average core power density [kW/dm <sup>3</sup> ]	: 50.6
Average fuel power density [kW/kgU]	: 26
Fuel linear heat generation rate [kW/m]	: 18.8

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 205

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 52200

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 10
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 0.83
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 7400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.4
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.9
LPSI system pressure [MPa]	: 1.2
HPSI system flowrate [t/h]	: 180
LPSI system flowrate [t/h]	: 950

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.82
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 1825

### Main generator

Rated active power [MWe]	: 1356
Rated apparent power [MVA]	: <Not Applicable>
Output voltage [kV]	: 27
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: <Not Applicable>
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 18200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 3410

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	:
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-CLAD
Reactor vessel overall length/height [m]	: 21
Inside shell diameter [m]	: 7.1
Shell thickness [mm]	: 170
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.75
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 5.16
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 872
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 151
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.70
Average core power density [kW/dm <sup>3</sup> ]	: 50.6
Average fuel power density [kW/kgU]	: 26
Fuel linear heat generation rate [kW/m]	: 18.8

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 205

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 52200

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 10
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 0.83
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 7400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.4
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.9
LPSI system pressure [MPa]	: 1.2
HPSI system flowrate [t/h]	: 180
LPSI system flowrate [t/h]	: 950

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.82
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 1825

### Main generator

Rated active power [MWe]	: 1356
Rated apparent power [MVA]	: <Not Applicable>
Output voltage [kV]	: 27
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: <Not Applicable>
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 6

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 18200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 3444

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 11
Inside shell diameter [m]	: 3.3
Shell thickness [mm]	: 228
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 31500
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.05
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 40
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 71
Average fuel power density [kW/kgU]	: 25.8
Fuel linear heat generation rate [kW/m]	: 15.5

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORON
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 294
Coolant mass flow at the rated power [t/h]	: 23500

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: alloyed steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 515.2
Design heat transfer surface [m2]	: 3280

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 3
Design pressure difference [MPa]	: 0.6

### Pressurizer

Total volume [m3]	: 19.8
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 700

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 41000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.24
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8.1
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 68.1
LPSI system flowrate [t/h]	: 307

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 1
HP cylinder inlet steam pressure [MPa]	: 5.39
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 2029

### Main generator

Rated active power [MWe]	: 340
Rated apparent power [MVA]	: 400
Output voltage [kV]	: 17
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 3



Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 6.82

Steam generator feedwater inlet temperature [°C] : 220.6

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 2

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 3

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Air cooled emergency diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 4.58

Total battery capacity [Ah] : 1200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 288

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12
Inside shell diameter [m]	: 3.4
Shell thickness [mm]	: 248
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.0
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33300
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.64
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 48
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 84
Average fuel power density [kW/kgU]	: 30.3
Fuel linear heat generation rate [kW/m]	: 18

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORON
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 320
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 30000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 728.0
Design heat transfer surface [m2]	: 4300

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.47
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m3]	: 28
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 41000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.24
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.5
LPSI system pressure [MPa]	: 0.7
HPSI system flowrate [t/h]	: 159
LPSI system flowrate [t/h]	: 454

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.34
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 269
HP cylinder Inlet steam flow rate [t/h]	: 2856

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: 560
Output voltage [kV]	: 17
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Copper
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 5.2

Steam generator feedwater inlet temperature [°C] : 221.1

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 2

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Air cooled emergency diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 6.22

Total battery capacity [Ah] : 1600

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 555

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 250
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.0
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.64
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 92
Average fuel power density [kW/kgU]	: 34
Fuel linear heat generation rate [kW/m]	: 20.3

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORON
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 45000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 812.9
Design heat transfer surface [m2]	: 5055

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 65000

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.24
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.2
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 147
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.8
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 274
HP cylinder Inlet steam flow rate [t/h]	: 4671

### Main generator

Rated active power [MWe]	: 826
Rated apparent power [MVA]	: 920
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.0

Steam generator feedwater inlet temperature [°C] : 221.1

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 2

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 3

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Air cooled emergency diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 6.82

Total battery capacity [Ah] : 2200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1118

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 273
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.1
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 38
Fuel linear heat generation rate [kW/m]	: 17.9

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Boron
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 60100

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 854.8
Design heat transfer surface [m <sup>2</sup> ]	: 4870

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m <sup>3</sup> ]	: 51
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Ice Condenser
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 37700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.082
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8.1
LPSI system pressure [MPa]	: 1.0
HPSI system flowrate [t/h]	: 96.5
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 276
HP cylinder Inlet steam flow rate [t/h]	: 6718

### Main generator

Rated active power [MWe]	: 1175
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 24
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.0

Steam generator feedwater inlet temperature [°C] : 222.2

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 2

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 3

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 3

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Air cooled emergency diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.42

Total battery capacity [Ah] : 2500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 704

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : Turbine Extraction

Number of heat connection points per unit : 1

Number of intermediate circuits/heat exchangers : 1



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: 2.7

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 273
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.1
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 38
Fuel linear heat generation rate [kW/m]	: 17.9

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Boron
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 60100

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 854.8
Design heat transfer surface [m2]	: 5055

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Ice Condenser
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 37700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.082
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8.1
LPSI system pressure [MPa]	: 1.0
HPSI system flowrate [t/h]	: 96.5
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 276
HP cylinder Inlet steam flow rate [t/h]	: 6718

### Main generator

Rated active power [MWe]	: 1175
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 24
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.0

Steam generator feedwater inlet temperature [°C] : 222.2

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 2

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 3

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 3

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Air cooled emergency diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.42

Total battery capacity [Ah] : 2500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 704

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : Turbine Extraction

Number of heat connection points per unit : 1

Number of intermediate circuits/heat exchangers : 1

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: 2.7

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 273
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.1
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 38
Fuel linear heat generation rate [kW/m]	: 17.9

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Boron
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 60100

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 856.0
Design heat transfer surface [m2]	: 4870

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 73700



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.4
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 9.4
LPSI system pressure [MPa]	: 1.0
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 273.9
HP cylinder Inlet steam flow rate [t/h]	: 6708

### Main generator

Rated active power [MWe]	: 1180
Rated apparent power [MVA]	: 1310
Output voltage [kV]	: 24
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 5.7

Steam generator feedwater inlet temperature [°C] : 223.8

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 3

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Air cooled emergency diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 10.02

Total battery capacity [Ah] : 1400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 2129

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 273
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.1
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 44000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 38
Fuel linear heat generation rate [kW/m]	: 17.9

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Boron
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 60100

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 856.0
Design heat transfer surface [m <sup>2</sup> ]	: 4870

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m <sup>3</sup> ]	: 51
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 73700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.4
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 9.4
LPSI system pressure [MPa]	: 1.0
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 273.9
HP cylinder Inlet steam flow rate [t/h]	: 6708

### Main generator

Rated active power [MWe]	: 1180
Rated apparent power [MVA]	: 1310
Output voltage [kV]	: 24
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 5.7

Steam generator feedwater inlet temperature [°C] : 223.8

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 3

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Air cooled emergency diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 10.02

Total battery capacity [Ah] : 1400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 2129

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASME SA-508 SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS AND HIGH-NI-STEEL
Reactor vessel overall length/height [m]	: 21
Inside shell diameter [m]	: 4.7
Shell thickness [mm]	: 110
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.9
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.30
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 368
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 63
Moderator weight [t]	: <Not Applicable>
Number of fuel elements per assembly/bundle	: 72
Fuel clad thickness [mm]	: 0.70
Average core power density [kW/dm <sup>3</sup> ]	: 50.3
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 15.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD2O3
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Applicable>
Number of control rod assemblies	: 89

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: <Not Applicable>
Operating coolant pressure [MPa]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 190
Coolant mass flow at the rated power [t/h]	: 22900

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 2.8
Design pressure difference [MPa]	: 1.6

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 7000

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.3
LPSI system pressure [MPa]	: 1.2
HPSI system flowrate [t/h]	: 680
LPSI system flowrate [t/h]	: 1090

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.55
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 2910

### Main generator

Rated active power [MWe]	: 524
Rated apparent power [MVA]	: 585
Output voltage [kV]	: 22
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Brass
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.7

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.1
Steam generator feedwater inlet temperature [°C]	: <Not Applicable>

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 3
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 9
Total battery capacity [Ah]	: 4400

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1050
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SQV2A SFVQ1A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS AND HIGH-NI-STEEL
Reactor vessel overall length/height [m]	: 21
Inside shell diameter [m]	: 5.6
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.7
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.07
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 97
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50.5
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 15.9

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD2O3
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Applicable>
Number of control rod assemblies	: 137

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 35600

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.7
Design pressure difference [MPa]	: 2.4

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 13000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.43
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.4
LPSI system pressure [MPa]	: 1
HPSI system flowrate [t/h]	: 320
LPSI system flowrate [t/h]	: 1160

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.55
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 4600

### Main generator

Rated active power [MWe]	: 825
Rated apparent power [MVA]	: 920
Output voltage [kV]	: 17
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 6



Number of main condensate pumps required for full power	: 4
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.7

**Feedwater system**

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.1
Steam generator feedwater inlet temperature [°C]	: <Not Applicable>

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 3
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 15.2
Total battery capacity [Ah]	: 8400

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 2240
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SQV2A SFVQ1A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS AND HIGH-NI-STEEL
Reactor vessel overall length/height [m]	: 21
Inside shell diameter [m]	: 5.6
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.7
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.07
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 97
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50.5
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 15.9

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD2O3
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Applicable>
Number of control rod assemblies	: 137

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 35600

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.7
Design pressure difference [MPa]	: 2.4

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 13000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.43
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 8.4
LPSI system pressure [MPa]	: 1
HPSI system flowrate [t/h]	: 320
LPSI system flowrate [t/h]	: 1100

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.55
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 4500

### Main generator

Rated active power [MWe]	: 825
Rated apparent power [MVA]	: 920
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 6

Number of main condensate pumps required for full power	: 4
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.7

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.1
Steam generator feedwater inlet temperature [°C]	: <Not Applicable>

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 3
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 15.2
Total battery capacity [Ah]	: 8400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 2816
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-GR-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.1
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 126
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 49000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 74
Moderator weight [t]	: 260
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 100
Average fuel power density [kW/kgU]	: 35.8
Fuel linear heat generation rate [kW/m]	: 17.1

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Boron
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 260
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 45700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: Ni-Cr-Fe Alloy
Drum separator shell material	:
Design thermal capacity per SG [MW]	: 886.67
Design heat transfer surface [m2]	: 5060

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.7

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 95600

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.22
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.2
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 147
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.07
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 266
HP cylinder Inlet steam flow rate [t/h]	: 5200

### Main generator

Rated active power [MWe]	: 890
Rated apparent power [MVA]	: 990
Output voltage [kV]	: 23
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.48

Steam generator feedwater inlet temperature [°C] : 291

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] : 11.4

Total battery capacity [Ah] : 2400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1868

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : Turbine Extraction

Number of heat connection points per unit : 2

Number of intermediate circuits/heat exchangers : 1

Total capacity of heat connections [MWt]	: 25
Extraction steam pressure [MPa]	: 2.66

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-GR-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.1
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 126
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 49000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 74
Moderator weight [t]	: 260
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 100
Average fuel power density [kW/kgU]	: 35.8
Fuel linear heat generation rate [kW/m]	: 17.1

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 260
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 45700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: Ni-Cr-Fe Alloy
Drum separator shell material	:
Design thermal capacity per SG [MW]	: 886.67
Design heat transfer surface [m2]	: 4780

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.7

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 109300

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.22
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.2
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 147
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.07
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 266
HP cylinder Inlet steam flow rate [t/h]	: 5203

### Main generator

Rated active power [MWe]	: 890
Rated apparent power [MVA]	: 990
Output voltage [kV]	: 23
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.48

Steam generator feedwater inlet temperature [°C] : 291

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] : 11.4

Total battery capacity [Ah] : 2400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1356

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : Turbine Extraction

Number of heat connection points per unit : 2

Number of intermediate circuits/heat exchangers : 1



Total capacity of heat connections [MWt]	: 25
Extraction steam pressure [MPa]	: 2.61

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SQV2A/SFVQ1A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: Stainless steel and high nickel alloyed steel
Reactor vessel overall length/height [m]	: 20.992
Inside shell diameter [m]	: 4.692
Shell thickness [mm]	: 116
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.8
Refuelling frequency [month]	: 15
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.30
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 368
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 64
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 72
Fuel clad thickness [mm]	: 0.70
Average core power density [kW/dm <sup>3</sup> ]	: 50.3
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 16

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: <Not Applicable>
Number of control rod assemblies	: 89

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 275
Operating coolant pressure [MPa]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 213
Coolant mass flow at the rated power [t/h]	: 22900

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 2.84
Design pressure difference [MPa]	: 1.62

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 11000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.427
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: 0.90
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: 810

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.55
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 3071

### Main generator

Rated active power [MWe]	: 540
Rated apparent power [MVA]	: 600
Output voltage [kV]	: 20
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 6

Number of main condensate pumps required for full power	: 4
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.1

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 10.1
Steam generator feedwater inlet temperature [°C]	:

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water Sprinkler Only
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	: Instrumentation use uninterruptive power supply
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 11.2
Total battery capacity [Ah]	: 7050

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1749
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SQV2A/SFVQ1A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: Stainless steel and high nickel alloyed steel
Reactor vessel overall length/height [m]	: 22.081
Inside shell diameter [m]	: 7.12
Shell thickness [mm]	: 174
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.8
Refuelling frequency [month]	: 15
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 5.16
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 872
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 150
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50.6
Average fuel power density [kW/kgU]	: 26
Fuel linear heat generation rate [kW/m]	: 17

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: <Not Applicable>
Number of control rod assemblies	: 205

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 455
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 52200

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 10
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 0.83
Design pressure difference [MPa]	: 0.39

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 17000



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.310
Design leakage rate [% per day]	: 0.4
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8.73
LPSI system pressure [MPa]	: 1.23
HPSI system flowrate [t/h]	: 182
LPSI system flowrate [t/h]	: 954

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.69
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 7288

### Main generator

Rated active power [MWe]	: 1358
Rated apparent power [MVA]	: 1540
Output voltage [kV]	: 24
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 6

Number of main condensate pumps required for full power	: 4
Condenser vacuum at the full power (absolute pressure) [kPa]	: 7.7

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.06
Steam generator feedwater inlet temperature [°C]	:

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water Sprinkler Only
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	: Instrumentation use uninterruptive power supply
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 15
Total battery capacity [Ah]	: 8900

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 3788
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-GR-B-CL-1
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: SA-371-ER-308-L
Reactor vessel overall length/height [m]	: 19.5
Inside shell diameter [m]	: 4.8
Shell thickness [mm]	: 117
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.6
Refuelling frequency [month]	: 14
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.44
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 400
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 68
Moderator weight [t]	: 150
Number of fuel elements per assembly/bundle	: 72
Fuel clad thickness [mm]	: 0.7
Average core power density [kW/dm <sup>3</sup> ]	: 40.6
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 44.0

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: Liquid zone control
Number of control rod assemblies	: 97

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 150
Operating coolant pressure [MPa]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 181
Coolant mass flow at the rated power [t/h]	: 21800

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 2
Design pressure difference [MPa]	: 0.41

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 2800

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.427
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 7.06
LPSI system pressure [MPa]	: 0.98
HPSI system flowrate [t/h]	: 680
LPSI system flowrate [t/h]	: 850

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.55
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 2450

### Main generator

Rated active power [MWe]	: 465
Rated apparent power [MVA]	: 520
Output voltage [kV]	: 18
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Brass
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 9.5

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : No cables

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 4

Total installed capacity of the on-site emergency power sources per unit [MW] : 6.4

Total battery capacity [Ah] : 4400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1140

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JIS G3120 and JIS G 3204
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: STAINLESS STEEL HIGH NICKLE ALLOY
Reactor vessel overall length/height [m]	: 21.9
Inside shell diameter [m]	: 5.6
Shell thickness [mm]	: 137
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.7
Refuelling frequency [month]	: 14
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.07
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 97
Moderator weight [t]	: 200
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50.5
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 44.0

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: Liquid zone control
Number of control rod assemblies	: 137

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 200
Operating coolant pressure [MPa]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 35600

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 2.40

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 7400

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.427
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	: 0.961
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	: 1140

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.55
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 4600

### Main generator

Rated active power [MWe]	: 820
Rated apparent power [MVA]	: 870
Output voltage [kV]	: 15.5
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Brass
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : 2

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.4

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 8

Total installed capacity of the on-site emergency power sources per unit [MW] : 15.9

Total battery capacity [Ah] : 6580

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 3518

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 250
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.0
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.64
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 92
Average fuel power density [kW/kgU]	: 34
Fuel linear heat generation rate [kW/m]	: 20.3

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORON
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 45000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 812.9
Design heat transfer surface [m2]	: 5055

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 65000

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.24
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.2
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 147
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.8
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 274
HP cylinder Inlet steam flow rate [t/h]	: 4671

### Main generator

Rated active power [MWe]	: 826
Rated apparent power [MVA]	: 920
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3



Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 221.1

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 3

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 3

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Air cooled emergency diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 6.82

Total battery capacity [Ah] : 2200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 424

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 250
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.0
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.64
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 92
Average fuel power density [kW/kgU]	: 34
Fuel linear heat generation rate [kW/m]	: 20.3

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORON
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 45000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 812.9
Design heat transfer surface [m2]	: 4870

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 65000

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.24
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.2
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 147
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.8
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 274
HP cylinder Inlet steam flow rate [t/h]	: 4671

### Main generator

Rated active power [MWe]	: 826
Rated apparent power [MVA]	: 920
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 221.1

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 3

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 3

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Air cooled emergency diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 6.82

Total battery capacity [Ah] : 2200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 424

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.4
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 250
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.1
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 100
Average fuel power density [kW/kgU]	: 37
Fuel linear heat generation rate [kW/m]	: 17.1

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORON
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 45700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 886.2
Design heat transfer surface [m <sup>2</sup> ]	: 4780

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m <sup>3</sup> ]	: 40
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 67400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.28
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.2
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 147
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.1
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 266.5
HP cylinder Inlet steam flow rate [t/h]	: 5067

### Main generator

Rated active power [MWe]	: 870
Rated apparent power [MVA]	: 970
Output voltage [kV]	: 23
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
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Condenser vacuum at the full power (absolute pressure) [kPa]	: 5
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### Feedwater system

Number of turbine driven main feedwater pumps	: 2
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Number of motor-driven main feedwater pumps	: 1
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Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
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Number of feedwater pumps required for full power operation	: 2
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Feedwater discharge pressure [MPa]	: 5.2
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Steam generator feedwater inlet temperature [°C]	: 221.7
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### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
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Number of diesel driven pumps	: <Not Applicable>
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Number of turbine driven pumps	: 1
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### Fire protection system

On-site fire suppression/extinguishing system	: Water Sprinkler Only
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Fire retardant cable coating used for	: Safety Related + Other systems
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Cable segregation within the unit used for	: Safety Related + Other systems
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On-site fire brigade	: Extra-duty Plant Personnel
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Off-site fire brigade response time	: Less than 30 min.
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### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 3
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Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 3
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Number of on-site safety related diesel generators (available per unit)	: 2
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Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
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Number of on site non-safety related diesel generator	:
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Number of on site non-safety related gas turbines	:
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Other on-site emergency AC power sources	: Air cooled emergency diesel generator
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Estimated time reserve of the batteries at full load [h]	: 2
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Total installed capacity of the on-site emergency power sources per unit [MW]	: 8.32
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Total battery capacity [Ah]	: 1200
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### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1188
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Interim storage facility type	: <Not Applicable>
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Interim storage facility capacity (number of spent fuel assemblies)	: -
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### Non-electrical applications

Primary heat connection	: Turbine Extraction
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Number of heat connection points per unit	: 1
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Number of intermediate circuits/heat exchangers	: 1
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Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: 2.5

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.4
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 250
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.1
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 100
Average fuel power density [kW/kgU]	: 37
Fuel linear heat generation rate [kW/m]	: 17.1

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORON
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 45700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 886.2
Design heat transfer surface [m2]	: 4780

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.48
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 67400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.28
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.2
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 147
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.21
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 266.5
HP cylinder Inlet steam flow rate [t/h]	: 5067

### Main generator

Rated active power [MWe]	: 870
Rated apparent power [MVA]	: 970
Output voltage [kV]	: 23
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 5.2

Steam generator feedwater inlet temperature [°C] : 221.7

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 3

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 3

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources : Air cooled emergency diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.32

Total battery capacity [Ah] : 1200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1188

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : Turbine Extraction

Number of heat connection points per unit : 1

Number of intermediate circuits/heat exchangers : 1



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: 2.5

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: MN-MO-NI STEEL
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 23
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 157
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.7
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 22
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 132
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 25
Fuel linear heat generation rate [kW/m]	: 15.9

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 48300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: Saturated Steam
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 5700

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.385
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 2.5
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 6418

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Brass
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] : 215

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for :

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 6000

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : Dry

Interim storage facility capacity (number of spent fuel assemblies) : <Not Available>

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JIS G3204, JIS G3120
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SUS304
Reactor vessel overall length/height [m]	: 11.5
Inside shell diameter [m]	: 3.4
Shell thickness [mm]	: 110
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 41000
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.64
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 48.5
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 95
Average fuel power density [kW/kgU]	: 34
Fuel linear heat generation rate [kW/m]	: 20.4

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 288
Coolant mass flow at the rated power [t/h]	: 30000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 825
Design heat transfer surface [m2]	: 4780

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.6
Design pressure difference [MPa]	: 0.78

### Pressurizer

Total volume [m3]	: 28
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 42400



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.254
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 9.8
LPSI system pressure [MPa]	: 0.84
HPSI system flowrate [t/h]	: 160
LPSI system flowrate [t/h]	: 454

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.41
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 3130

### Main generator

Rated active power [MWe]	: 579
Rated apparent power [MVA]	: 650
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 4

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 5.9

Steam generator feedwater inlet temperature [°C] : 226

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 4.74

Total battery capacity [Ah] : 1400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 690

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JIS G3204, JIS G3120
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SUS304
Reactor vessel overall length/height [m]	: 11.5
Inside shell diameter [m]	: 3.4
Shell thickness [mm]	: 110
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 41000
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.64
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 48.5
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 95
Average fuel power density [kW/kgU]	: 34
Fuel linear heat generation rate [kW/m]	: 20.4

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 288
Coolant mass flow at the rated power [t/h]	: 30000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 825
Design heat transfer surface [m2]	: 4780

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.6
Design pressure difference [MPa]	: 0.78

### Pressurizer

Total volume [m3]	: 28
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 42400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.254
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 9.8
LPSI system pressure [MPa]	: 0.84
HPSI system flowrate [t/h]	: 160
LPSI system flowrate [t/h]	: 454

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.41
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 3130

### Main generator

Rated active power [MWe]	: 579
Rated apparent power [MVA]	: 650
Output voltage [kV]	: 19
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 4

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 5.9

Steam generator feedwater inlet temperature [°C] : 226

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 4.74

Total battery capacity [Ah] : 1400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 690

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: JIS G3204, JIS G3120
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SUS304
Reactor vessel overall length/height [m]	: 12.4
Inside shell diameter [m]	: 4.0
Shell thickness [mm]	: 126
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 49000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 74
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 100
Average fuel power density [kW/kgU]	: 36
Fuel linear heat generation rate [kW/m]	: 17.1

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 288
Coolant mass flow at the rated power [t/h]	: 45400

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 886.67
Design heat transfer surface [m2]	: 5060

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.6
Design pressure difference [MPa]	: 0.78

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 66000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.283
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 9.5
LPSI system pressure [MPa]	: 0.82
HPSI system flowrate [t/h]	: 280
LPSI system flowrate [t/h]	: 681

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.48
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 270.8
HP cylinder Inlet steam flow rate [t/h]	: 5000

### Main generator

Rated active power [MWe]	: 912
Rated apparent power [MVA]	: 1020
Output voltage [kV]	: 21
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 4

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 5.9

Steam generator feedwater inlet temperature [°C] : 216

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 5.6

Total battery capacity [Ah] : 2400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1440

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B-MOCI, SA-336
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 18.8
Inside shell diameter [m]	: 4.3
Shell thickness [mm]	: 144
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.7
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 19
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.02
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 308
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 52
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 74
Fuel clad thickness [mm]	: 0.71
Average core power density [kW/dm <sup>3</sup> ]	: 40.6
Average fuel power density [kW/kgU]	: 20
Fuel linear heat generation rate [kW/m]	: 12.9

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 6.9
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 189
Coolant mass flow at the rated power [t/h]	: 17700

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: Saturated Steam
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 0.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 4030

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.426
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 9.1
LPSI system pressure [MPa]	: 1.6
HPSI system flowrate [t/h]	: 570
LPSI system flowrate [t/h]	: 465

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 1
HP cylinder inlet steam pressure [MPa]	: 6.55
HP cylinder Inlet steam moisture [%]	: 0.28
HP cylinder inlet steam temperature [°C]	: 282.4
HP cylinder Inlet steam flow rate [t/h]	: 1920

### Main generator

Rated active power [MWe]	: 357
Rated apparent power [MVA]	: 420
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Brass
Number of main condensate pumps	: 3



Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 8.2

Steam generator feedwater inlet temperature [°C] : 189

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for :

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 6500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 574

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.9
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 135
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.1
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.07
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	: 344
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 38
Fuel linear heat generation rate [kW/m]	: 17.9

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: Liquid zone control
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: 344
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 60000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600TT
SG shell material	: Alloyed Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 855.75
Design heat transfer surface [m2]	: 4780

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 1.4

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 73300

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 5.0
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	: 153
LPSI system flowrate [t/h]	: 1020

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.76
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 274
HP cylinder Inlet steam flow rate [t/h]	: 6623.5

### Main generator

Rated active power [MWe]	: 1160
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: 24
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : 1

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] : 221

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for :

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] : 10000

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1734

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA508CL2
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.98
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200.1
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: <Not Available>
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 41
Average discharge burnup [MWd/t]	: 18190
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.658
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.85
Moderator weight [t]	: <Not Available>
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 41.8
Fuel linear heat generation rate [kW/m]	: 17.83

#### Reactivity control



Control rod material	: Cadmium Alloy
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 246.3566
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 80409

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: SA533
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 929
Design heat transfer surface [m2]	: 5114

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.3
Design pressure difference [MPa]	: 0.9

### Pressurizer

Total volume [m3]	: 39.64
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 58899
Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.41
Design leakage rate [% per day]	: 0.06
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17.8
LPSI system pressure [MPa]	: 0.807
HPSI system flowrate [t/h]	: 34.0687
LPSI system flowrate [t/h]	: 681.4

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.54
HP cylinder Inlet steam moisture [%]	: 0.43
HP cylinder inlet steam temperature [°C]	: 281.2
HP cylinder Inlet steam flow rate [t/h]	: 5565

### Main generator

Rated active power [MWe]	: 997
Rated apparent power [MVA]	: 1284
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium

Number of main condensate pumps	: 4
Number of main condensate pumps required for full power	: 3
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.9329

**Feedwater system**

Number of turbine driven main feedwater pumps	: 3
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 3
Feedwater discharge pressure [MPa]	: 8.56
Steam generator feedwater inlet temperature [°C]	: 231

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 2.2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 7.4
Total battery capacity [Ah]	: 6480

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 2262

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA508CL3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS_304
Reactor vessel overall length/height [m]	: 12.98
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200.1
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: <Not Available>
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 41
Average discharge burnup [MWd/t]	: 17960
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.658
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.76
Moderator weight [t]	: <Not Available>
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 41.8
Fuel linear heat generation rate [kW/m]	: 17.83

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Applicable>
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 246.3566
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 80409

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: SA533
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 929
Design heat transfer surface [m2]	: 5114

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.3
Design pressure difference [MPa]	: 0.9

### Pressurizer

Total volume [m3]	: 39.64
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 58899

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.41
Design leakage rate [% per day]	: 0.06
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17.3
LPSI system pressure [MPa]	: 0.807
HPSI system flowrate [t/h]	: 34.0687
LPSI system flowrate [t/h]	: 681.4

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.54
HP cylinder Inlet steam moisture [%]	: 0.43
HP cylinder inlet steam temperature [°C]	: 281.4
HP cylinder Inlet steam flow rate [t/h]	: 5565

### Main generator

Rated active power [MWe]	: 997
Rated apparent power [MVA]	: 1284
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power	: 3
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.9329

**Feedwater system**

Number of turbine driven main feedwater pumps	: 3
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 3
Feedwater discharge pressure [MPa]	: 8.56
Steam generator feedwater inlet temperature [°C]	: 231

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 2.2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 7.4
Total battery capacity [Ah]	: 6480

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 1152

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>



Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

KR-11

HANBIT-3

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA508CL4
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-309
Reactor vessel overall length/height [m]	: 14.4
Inside shell diameter [m]	: 4.18
Shell thickness [mm]	: 204.7
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: 4.2
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36
Average discharge burnup [MWd/t]	: 42700
Active core diameter [m]	: 3.124
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76.25
Moderator weight [t]	: 273.3
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 96.6
Average fuel power density [kW/kgU]	: 36.9
Fuel linear heat generation rate [kW/m]	: 17.26

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: B4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 282
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 60732

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: Carbon Steel/Stainless Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1413.4
Design heat transfer surface [m2]	: 7016

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6
Design pressure difference [MPa]	: 0.35

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 76400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.37
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 14.0
LPSI system pressure [MPa]	: 0.5
HPSI system flowrate [t/h]	: 144
LPSI system flowrate [t/h]	: 954

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 7.14
HP cylinder Inlet steam moisture [%]	: 0.50
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5539

### Main generator

Rated active power [MWe]	: 1049
Rated apparent power [MVA]	: 1213
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power : 3

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : 1

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 10.2

Steam generator feedwater inlet temperature [°C] : 234

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : 2

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Applicable>

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 1

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : AAC D/G

Estimated time reserve of the batteries at full load [h] : 4

Total installed capacity of the on-site emergency power sources per unit [MW] : 13

Total battery capacity [Ah] : 11200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Applicable>

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 1302

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

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HANBIT-4

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA508CL5
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-309
Reactor vessel overall length/height [m]	: 14.64
Inside shell diameter [m]	: 4.18
Shell thickness [mm]	: 204.7
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: 4.2
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36
Average discharge burnup [MWd/t]	: 42700
Active core diameter [m]	: 3.124
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76.25
Moderator weight [t]	: 273.3
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 96.6
Average fuel power density [kW/kgU]	: 36.9
Fuel linear heat generation rate [kW/m]	: 17.26

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: B4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 282
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 60732

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: Carbon Steel/Stainless Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1413.4
Design heat transfer surface [m2]	: 7016

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6
Design pressure difference [MPa]	: 0.35

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 76400



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.37
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 14.0
LPSI system pressure [MPa]	: 0.5
HPSI system flowrate [t/h]	: 144
LPSI system flowrate [t/h]	: 954

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 7.14
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5539

### Main generator

Rated active power [MWe]	: 1049
Rated apparent power [MVA]	: 1213
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power : 3

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : 1

Number of start-up feed-water pumps (if different from the auxiliary FWP) : 1

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 10.2

Steam generator feedwater inlet temperature [°C] : 234

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : 2

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Extra-duty Plant Personnel

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Applicable>

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 1

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : AAC D/G

Estimated time reserve of the batteries at full load [h] : 4

Total installed capacity of the on-site emergency power sources per unit [MW] : 13

Total battery capacity [Ah] : 11200

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Applicable>

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 1302

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

KR-17

HANBIT-5

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA508CL6
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: ER309L
Reactor vessel overall length/height [m]	: 14.45
Inside shell diameter [m]	: 4.18
Shell thickness [mm]	: 204.7
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zircalloy-4/Zirlo
Average fuel enrichment [% of U235]	: 4
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36
Average discharge burnup [MWd/t]	: 13820
Active core diameter [m]	: 3.124
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76.29
Moderator weight [t]	: 310.9
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 96.26
Average fuel power density [kW/kgU]	: 41.8
Fuel linear heat generation rate [kW/m]	: 19.68

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203-UO2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 328.5
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 55110

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: Carbon Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1413
Design heat transfer surface [m2]	: 9522

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.6
Design pressure difference [MPa]	: 1

### Pressurizer

Total volume [m3]	: 51.4
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 77220.5

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.075
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8.5
LPSI system pressure [MPa]	: 1
HPSI system flowrate [t/h]	: 185
LPSI system flowrate [t/h]	: 871.2

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 4
HP cylinder inlet steam pressure [MPa]	: 7.14
HP cylinder Inlet steam moisture [%]	: 0.45
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5507

### Main generator

Rated active power [MWe]	: 1050
Rated apparent power [MVA]	: 1219.6
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.08

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 9.3
Steam generator feedwater inlet temperature [°C]	: 233

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 5
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 10
Total installed capacity of the on-site emergency power sources per unit [MW]	: 7.2
Total battery capacity [Ah]	: 19400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 700

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>



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HANBIT-6

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA508CL6
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: ER309L
Reactor vessel overall length/height [m]	: 14.45
Inside shell diameter [m]	: 4.18
Shell thickness [mm]	: 204.7
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zircalloy-4/Zirlo
Average fuel enrichment [% of U235]	: 4
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36
Average discharge burnup [MWd/t]	: 13450
Active core diameter [m]	: 3.124
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76.32
Moderator weight [t]	: 310.9
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 96.26
Average fuel power density [kW/kgU]	: 41.8
Fuel linear heat generation rate [kW/m]	: 19.68

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203-UO2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 328.5
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 55110

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: Carbon Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1413
Design heat transfer surface [m2]	: 9522

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.6
Design pressure difference [MPa]	: 1

### Pressurizer

Total volume [m3]	: 51.4
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 77220.5

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.075
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8.5
LPSI system pressure [MPa]	: 1
HPSI system flowrate [t/h]	: 185
LPSI system flowrate [t/h]	: 871.2

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 7.14
HP cylinder Inlet steam moisture [%]	: 0.45
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5507

### Main generator

Rated active power [MWe]	: 1050
Rated apparent power [MVA]	: 1219.6
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.08

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 9.3
Steam generator feedwater inlet temperature [°C]	: 233

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 5
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 10
Total installed capacity of the on-site emergency power sources per unit [MW]	: 7.2
Total battery capacity [Ah]	: 19400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 700

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: MNMONI(16-MND-5)
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: AISI308_309
Reactor vessel overall length/height [m]	: 13.175
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zircallo-4
Average fuel enrichment [% of U235]	: 4
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 38
Average discharge burnup [MWd/t]	: 42500
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.86
Moderator weight [t]	: 270
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.83

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 270
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 323.2
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 66253

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: low alloy steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 928.3
Design heat transfer surface [m <sup>2</sup> ]	: 4699

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.9
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m <sup>3</sup> ]	: 40.3
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 49400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17
LPSI system pressure [MPa]	: 0.7
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 740

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.53
HP cylinder Inlet steam moisture [%]	: 0.31
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 5446

### Main generator

Rated active power [MWe]	: 986
Rated apparent power [MVA]	: 1100
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 3



Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.08

### Feedwater system

Number of turbine driven main feedwater pumps	: 3
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7
Steam generator feedwater inlet temperature [°C]	: 219.5

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 3
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: -
Number of on site non-safety related gas turbines	: -
Other on-site emergency AC power sources	: 0
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 9
Total battery capacity [Ah]	: 5180

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 1114

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

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HANUL-2

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: MNMONI(16-MND-5)
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: AISI308_310
Reactor vessel overall length/height [m]	: 10.50
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRCALLOY-4
Average fuel enrichment [% of U235]	: 4
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 38
Average discharge burnup [MWd/t]	: 42500
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.86
Moderator weight [t]	: 270
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.83

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 270
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 323.2
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 66682

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600TT
SG shell material	: Low Alloy Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 928.3
Design heat transfer surface [m2]	: 4699

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.9
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m3]	: 40.3
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: 49400

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17.0
LPSI system pressure [MPa]	: 0.7
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 740

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.53
HP cylinder Inlet steam moisture [%]	: 0.31
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 5446

### Main generator

Rated active power [MWe]	: 986
Rated apparent power [MVA]	: 1100
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.08

### Feedwater system

Number of turbine driven main feedwater pumps	: 3
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7
Steam generator feedwater inlet temperature [°C]	: 219.5

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 3
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 0
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 9
Total battery capacity [Ah]	: 5180

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 1062

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

KR-13

HANUL-3

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508 CL3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: ER308L
Reactor vessel overall length/height [m]	: 14.642
Inside shell diameter [m]	: 4.134
Shell thickness [mm]	: 267
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zircaloy-4/Zirlo
Average fuel enrichment [% of U235]	: 4
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36.7
Average discharge burnup [MWd/t]	: 45800
Active core diameter [m]	: 3.122
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 79.296
Moderator weight [t]	: 297.56
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 96.7
Average fuel power density [kW/kgU]	: 36.89
Fuel linear heat generation rate [kW/m]	: 17.24

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203-UO2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 300.1581
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 55110

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: SA508 CL.3
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1413.4
Design heat transfer surface [m2]	: 9522.562

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.562
Design pressure difference [MPa]	: 0.7

### Pressurizer

Total volume [m3]	: 25.48
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: 77200

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.2
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 14.1
LPSI system pressure [MPa]	: 0.62
HPSI system flowrate [t/h]	: 185
LPSI system flowrate [t/h]	: 874.4

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 7.136
HP cylinder Inlet steam moisture [%]	: 0.45
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5506.985

### Main generator

Rated active power [MWe]	: 1049
Rated apparent power [MVA]	: 1219.6
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.0796

**Feedwater system**

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.825
Steam generator feedwater inlet temperature [°C]	: 234

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 5
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 10
Total installed capacity of the on-site emergency power sources per unit [MW]	: 21.6
Total battery capacity [Ah]	: 16800

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 678

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

KR-14

HANUL-4

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508 CL.3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: ER308L
Reactor vessel overall length/height [m]	: 14.642
Inside shell diameter [m]	: 4.134
Shell thickness [mm]	: 267
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zircaloy-4/Zirlo
Average fuel enrichment [% of U235]	: 4
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36
Average discharge burnup [MWd/t]	: 46603
Active core diameter [m]	: 3.122
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76.256
Moderator weight [t]	: 297.56
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 96.7
Average fuel power density [kW/kgU]	: 36.91
Fuel linear heat generation rate [kW/m]	: 17.24

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203-UO2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 300.1581
Operating coolant pressure [MPa]	: 15.52502
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 55110

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: SA508 CL.3
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1413.4
Design heat transfer surface [m2]	: 9522.562

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.562
Design pressure difference [MPa]	: 0.7

### Pressurizer

Total volume [m3]	: 25.48
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: 77200

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.2
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 14.1
LPSI system pressure [MPa]	: 0.62
HPSI system flowrate [t/h]	: 185
LPSI system flowrate [t/h]	: 8744

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 7.136
HP cylinder Inlet steam moisture [%]	: 0.45
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5506.985

### Main generator

Rated active power [MWe]	: 1049
Rated apparent power [MVA]	: 1219.6
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.0796

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.825
Steam generator feedwater inlet temperature [°C]	: 234

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 5
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 10
Total installed capacity of the on-site emergency power sources per unit [MW]	: 21.6
Total battery capacity [Ah]	: 16800

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 678

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>



Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

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HANUL-5

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508/AUSTENITE-SS
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: AISI308_313
Reactor vessel overall length/height [m]	: 14.445
Inside shell diameter [m]	: 3.96
Shell thickness [mm]	: 259
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: 5
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36.15
Average discharge burnup [MWd/t]	: 38723
Active core diameter [m]	: 3.12
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 75.941
Moderator weight [t]	: 328.5
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 96.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.69

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD2O3
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 180

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 328.5
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 55112.4

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: SA-508
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1412.5
Design heat transfer surface [m2]	: <Not Available>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 4.963
Design pressure difference [MPa]	: 0.72

### Pressurizer

Total volume [m3]	: 50.97
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 77220

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.05
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 14.2
LPSI system pressure [MPa]	: 0.62
HPSI system flowrate [t/h]	: 254
LPSI system flowrate [t/h]	: 1135.0

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 7.14
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5780

### Main generator

Rated active power [MWe]	: 1050
Rated apparent power [MVA]	: 1209.6
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.066

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.97
Steam generator feedwater inlet temperature [°C]	: 232

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 4
Total installed capacity of the on-site emergency power sources per unit [MW]	: 13.6
Total battery capacity [Ah]	: 2800

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1458
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Available>

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

KR-20

HANUL-6

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508/AUSTENITE-SS
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: AISI308_314
Reactor vessel overall length/height [m]	: 14.445
Inside shell diameter [m]	: 3.962
Shell thickness [mm]	: 259
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: 5
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36.15
Average discharge burnup [MWd/t]	: 38829
Active core diameter [m]	: 3.124
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 75.941
Moderator weight [t]	: 328.5
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 96.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.69

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD2O3
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 180

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 328.5
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 55112.4

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: SA-508
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1412.5
Design heat transfer surface [m2]	: <Not Available>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 4.963
Design pressure difference [MPa]	: 0.72

### Pressurizer

Total volume [m3]	: 50.97
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 77220



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.05
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 14.2
LPSI system pressure [MPa]	: 0.62
HPSI system flowrate [t/h]	: 254
LPSI system flowrate [t/h]	: 1135.0

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 7.14
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5780

### Main generator

Rated active power [MWe]	: 1050
Rated apparent power [MVA]	: 1219.6
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.066

**Feedwater system**

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.97
Steam generator feedwater inlet temperature [°C]	: 232

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 4
Total installed capacity of the on-site emergency power sources per unit [MW]	: 13.6
Total battery capacity [Ah]	: 2800

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1458
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Available>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 11.89
Inside shell diameter [m]	: 3.35
Shell thickness [mm]	: 165.1
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: IMP ZR-4
Average fuel enrichment [% of U235]	: 3.8
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 42326
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.658
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 43.61
Moderator weight [t]	: 173
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.617
Average core power density [kW/dm <sup>3</sup> ]	: 99.1
Average fuel power density [kW/kgU]	: 39.52
Fuel linear heat generation rate [kW/m]	: 21.75

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 173
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 319.9
Reactor inlet temperature [°C]	: 282
Coolant mass flow at the rated power [t/h]	: 30708

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690
SG shell material	: SA508
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 864.25
Design heat transfer surface [m2]	: 5119

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5
Design pressure difference [MPa]	: 0.78

### Pressurizer

Total volume [m3]	: 28
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 41059

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.30
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8.1
LPSI system pressure [MPa]	: 0.84
HPSI system flowrate [t/h]	: 159
LPSI system flowrate [t/h]	: 454.2

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 3
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.17
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 267
HP cylinder Inlet steam flow rate [t/h]	: 3267

### Main generator

Rated active power [MWe]	: 587
Rated apparent power [MVA]	: 749
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power : 3

Condenser vacuum at the full power (absolute pressure) [kPa] : 4

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : 2

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.7

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related cables

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : One Non-Class 1E diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 2.92

Total battery capacity [Ah] : 1700

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Applicable>

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 562

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS 304
Reactor vessel overall length/height [m]	: 11.93
Inside shell diameter [m]	: 3.35
Shell thickness [mm]	: 168.4
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: IMP ZR-4
Average fuel enrichment [% of U235]	: 3.8
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 36946
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.658
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 49.99
Moderator weight [t]	: 170
Number of fuel elements per assembly/bundle	: 235
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 107.9
Average fuel power density [kW/kgU]	: 37.53
Fuel linear heat generation rate [kW/m]	: 18.04

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Borosilicate Glass
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 170
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 324.5
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 32250

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: SA508
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 941
Design heat transfer surface [m <sup>2</sup> ]	: 5114

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 6
Design pressure difference [MPa]	: 0.85

### Pressurizer

Total volume [m <sup>3</sup> ]	: 28
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 40776

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8.22
LPSI system pressure [MPa]	: 0.79
HPSI system flowrate [t/h]	: 159
LPSI system flowrate [t/h]	: 454.2

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 3
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.35
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 276
HP cylinder Inlet steam flow rate [t/h]	: 3676

### Main generator

Rated active power [MWe]	: 650
Rated apparent power [MVA]	: 764.7
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power : 3

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : 2

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 8.4

Steam generator feedwater inlet temperature [°C] : 222

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : No cables

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : One Non-Class 1E diesel generator

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 4.4

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Applicable>

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 920

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.98
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200.1
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: 4.5
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 41
Average discharge burnup [MWd/t]	: 17910
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.658
Number of fissile fuel assemblies/bundles	: 151
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.76
Moderator weight [t]	: 177.56
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.4
Fuel linear heat generation rate [kW/m]	: 17.83

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 177.56
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 291.5
Coolant mass flow at the rated power [t/h]	: 66611

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: Carbon Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 929
Design heat transfer surface [m2]	: 5109.7

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.2
Design pressure difference [MPa]	: 1.166

### Pressurizer

Total volume [m3]	: 39.24
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Other - -
Total containment volume [m3]	: 58899

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17.3
LPSI system pressure [MPa]	: 0.807
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 681.4

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.53
HP cylinder Inlet steam moisture [%]	: 0.9975
HP cylinder inlet steam temperature [°C]	: 282.3
HP cylinder Inlet steam flow rate [t/h]	: 5565.5

### Main generator

Rated active power [MWe]	: 993
Rated apparent power [MVA]	: 1222.22
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 4



Number of main condensate pumps required for full power	: 3
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.9329

**Feedwater system**

Number of turbine driven main feedwater pumps	: 3
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 3
Feedwater discharge pressure [MPa]	: 1.125
Steam generator feedwater inlet temperature [°C]	: 226.6

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: <Not Applicable>
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: AAC D/G
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 14
Total battery capacity [Ah]	: <Not Available>

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 2260

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.98
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200.1
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.5
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 41
Average discharge burnup [MWd/t]	: 18210
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.658
Number of fissile fuel assemblies/bundles	: 151
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 73.09
Moderator weight [t]	: 177.56
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.4
Fuel linear heat generation rate [kW/m]	: 17.83

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 177.56
Operating coolant pressure [MPa]	: 15.2
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 291.5
Coolant mass flow at the rated power [t/h]	: 66611

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: Carbon Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 929
Design heat transfer surface [m2]	: 5109.7

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.2
Design pressure difference [MPa]	: 1.166

### Pressurizer

Total volume [m3]	: 39.64
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Other - -
Total containment volume [m3]	: 58899

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17.3
LPSI system pressure [MPa]	: 0.807
HPSI system flowrate [t/h]	: 34
LPSI system flowrate [t/h]	: 681.4

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.53
HP cylinder Inlet steam moisture [%]	: 0.9975
HP cylinder inlet steam temperature [°C]	: 282.3
HP cylinder Inlet steam flow rate [t/h]	: 5565.5

### Main generator

Rated active power [MWe]	: 993
Rated apparent power [MVA]	: 1222.22
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power	: 3
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.9329

### Feedwater system

Number of turbine driven main feedwater pumps	: 3
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 3
Feedwater discharge pressure [MPa]	: 1.125
Steam generator feedwater inlet temperature [°C]	: 226.6

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: <Not Applicable>
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: AAC D/G
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 14
Total battery capacity [Ah]	: <Not Available>

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 2262

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

KR-21

SHIN-KORI-1

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: SA508 Gr.3 Cl-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 14.454
Inside shell diameter [m]	: 3.962
Shell thickness [mm]	: 259
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zirlo
Average fuel enrichment [% of U235]	: 3.9
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36.15
Average discharge burnup [MWd/t]	: 38829
Active core diameter [m]	: 3.81
Active core height/length [m]	: 3.124
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 75.93
Moderator weight [t]	: 328.5
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 96.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.69

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 180

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 287.4
Operating coolant pressure [MPa]	: 17.237
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 55112.4

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Inconel-690
SG shell material	: SA-508
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1412.5
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 4.963
Design pressure difference [MPa]	: 0.72

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 77220

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.05
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 14.13
LPSI system pressure [MPa]	: 0.62
HPSI system flowrate [t/h]	: 185
LPSI system flowrate [t/h]	: 874

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 7.14
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5780

### Main generator

Rated active power [MWe]	: 1053
Rated apparent power [MVA]	: 1219.6
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.06

**Feedwater system**

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.97
Steam generator feedwater inlet temperature [°C]	: 232

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 4
Total installed capacity of the on-site emergency power sources per unit [MW]	: 13.6
Total battery capacity [Ah]	: 2800

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 1174

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

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SHIN-KORI-2

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: SA508 Gr.3 Cl-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 14.454
Inside shell diameter [m]	: 3.962
Shell thickness [mm]	: 259
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zirlo
Average fuel enrichment [% of U235]	: 3.9
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36.15
Average discharge burnup [MWd/t]	: 38829
Active core diameter [m]	: 3.81
Active core height/length [m]	: 3.124
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 75.93
Moderator weight [t]	: 328.5
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 96.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.69

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 180

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 287.4
Operating coolant pressure [MPa]	: 17.237
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 55112.4

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Inconel-690
SG shell material	: SA-508
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1412.5
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 4.963
Design pressure difference [MPa]	: 0.72

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 77220

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.05
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 14.13
LPSI system pressure [MPa]	: 0.62
HPSI system flowrate [t/h]	: 185
LPSI system flowrate [t/h]	: 874

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 7.14
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5780

### Main generator

Rated active power [MWe]	: 1053
Rated apparent power [MVA]	: 1219.6
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.06

**Feedwater system**

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.97
Steam generator feedwater inlet temperature [°C]	: 232

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 4
Total installed capacity of the on-site emergency power sources per unit [MW]	: 13.6
Total battery capacity [Ah]	: 2800

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 1174

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>



Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

KR-23

SHIN-WOLSONG-1

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: SA508 Gr.3 Cl-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 14.454
Inside shell diameter [m]	: 3.962
Shell thickness [mm]	: 259
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zirlo
Average fuel enrichment [% of U235]	: 3.9
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 36.15
Average discharge burnup [MWd/t]	: 38829
Active core diameter [m]	: 3.81
Active core height/length [m]	: 3.124
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 75.93
Moderator weight [t]	: 328.5
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 96.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.69

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 180

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 287.4
Operating coolant pressure [MPa]	: 17.237
Reactor outlet temperature [°C]	: 327.3
Reactor inlet temperature [°C]	: 295.8
Coolant mass flow at the rated power [t/h]	: 55112.4

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Inconel-690
SG shell material	: SA-508
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1412.5
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.562
Design pressure difference [MPa]	: 0.72

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 3
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 77220

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	: 0.05
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 14.13
LPSI system pressure [MPa]	: 0.62
HPSI system flowrate [t/h]	: 195
LPSI system flowrate [t/h]	: 874

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 7.14
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 287.1
HP cylinder Inlet steam flow rate [t/h]	: 5780

### Main generator

Rated active power [MWe]	: 1054.6
Rated apparent power [MVA]	: 1219.6
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.06

### Feedwater system

Number of turbine driven main feedwater pumps	: 3
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 3
Feedwater discharge pressure [MPa]	: 8.97
Steam generator feedwater inlet temperature [°C]	: 232

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 4
Total installed capacity of the on-site emergency power sources per unit [MW]	: 18.6
Total battery capacity [Ah]	: 2800

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 1174

### Non-electrical applications

Primary heat connection	: -
Number of heat connection points per unit	: -
Number of intermediate circuits/heat exchangers	: -

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

KR-3

WOLSONG-1

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA240 TP304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 10.82
Inside shell diameter [m]	: 7.60
Shell thickness [mm]	: 28.6
Number of pressure channels	: 380
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.19

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 0.72
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 7500
Active core diameter [m]	: 7.69
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 87
Moderator weight [t]	: 250
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 11.2
Average fuel power density [kW/kgU]	: 23.69
Fuel linear heat generation rate [kW/m]	: 0.1615

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: cadmium
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: Gd Injection
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 120.2
Operating coolant pressure [MPa]	: 10.5
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 266
Coolant mass flow at the rated power [t/h]	: 8020

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: 8
Tube shape	: U-tube
Tube material	: Incoloy800
SG shell material	: SA-516 Gr.70
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 516
Design heat transfer surface [m2]	: 3205

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.7
Design pressure difference [MPa]	: 1.8

### Pressurizer

Total volume [m3]	: 45.3
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 48000



Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.12
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: 0.59
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: 2182.0

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 4.59
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 257.5
HP cylinder Inlet steam flow rate [t/h]	: 3439.8

### Main generator

Rated active power [MWe]	: 678.7
Rated apparent power [MVA]	: 800
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power : 1

Condenser vacuum at the full power (absolute pressure) [kPa] : 6

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 6.55

Steam generator feedwater inlet temperature [°C] : 186.7

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 1

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : <Not Applicable>

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 13.5

Total battery capacity [Ah] : 1400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Applicable>

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 42408

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

KR-4

WOLSONG-2

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA240 TP304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 10.82
Inside shell diameter [m]	: 7.59
Shell thickness [mm]	: 28.6
Number of pressure channels	: 380
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.19

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 0.72
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 7500
Active core diameter [m]	: 7.69
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 87
Moderator weight [t]	: 250
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 11.2
Average fuel power density [kW/kgU]	: 23.69
Fuel linear heat generation rate [kW/m]	: 0.1615

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: cadimium
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: Gd Injection
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 120.2
Operating coolant pressure [MPa]	: 10.5
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 266
Coolant mass flow at the rated power [t/h]	: 8020

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Incoloy 800
SG shell material	: SA516 Gr.70
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 516
Design heat transfer surface [m2]	: 3197

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.7
Design pressure difference [MPa]	: 1.83

### Pressurizer

Total volume [m3]	: 45.3
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: Vacuum Building
Total containment volume [m3]	: 48000

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.12
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: 0.68
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: 2182

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 4.59
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 257.5
HP cylinder Inlet steam flow rate [t/h]	: 3584.8

### Main generator

Rated active power [MWe]	: 713
Rated apparent power [MVA]	: 828
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power : 1

Condenser vacuum at the full power (absolute pressure) [kPa] : 6

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 6.5

Steam generator feedwater inlet temperature [°C] : 188.7

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 1

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : 1

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 13

Total battery capacity [Ah] : <Not Applicable>

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Applicable>

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 42408

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>



KR-15

WOLSONG-3

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SS304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: <Not Applicable>
Inside shell diameter [m]	: 7.60
Shell thickness [mm]	: 43.4
Number of pressure channels	: 380
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.19

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: <Not Applicable>
Average fuel enrichment [% of U235]	: 0.71
Refuelling frequency [month]	: 15
Part of the core refuelled [%]	: 96
Average discharge burnup [MWd/t]	: 7296
Active core diameter [m]	: 7.69
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 84
Moderator weight [t]	: 236
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.4
Average core power density [kW/dm <sup>3</sup> ]	: 11.2
Average fuel power density [kW/kgU]	: 23.69
Fuel linear heat generation rate [kW/m]	: 0.1615

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: Gd Injection
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 180
Operating coolant pressure [MPa]	: 10.5
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 266
Coolant mass flow at the rated power [t/h]	: 8020

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Available>
Tube shape	: U-tube
Tube material	: Incoloy 800
SG shell material	: Carbon Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 516
Design heat transfer surface [m2]	: 3197

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.7
Design pressure difference [MPa]	: 1.83

### Pressurizer

Total volume [m3]	: 45
Number of safety valves	: <Not Applicable>
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 48480

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.12
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: 0.7
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: 2181.6

### Reactor protection system

Control equipment technology	: <Not Applicable>
Number of independent system divisions	: <Not Applicable>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Applicable>
Number of independent system divisions	: <Not Applicable>

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 4.59
HP cylinder Inlet steam moisture [%]	: 0.9968
HP cylinder inlet steam temperature [°C]	: 257.5
HP cylinder Inlet steam flow rate [t/h]	: 3584.8

### Main generator

Rated active power [MWe]	: 713
Rated apparent power [MVA]	: 828
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power : 1

Condenser vacuum at the full power (absolute pressure) [kPa] : 6

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 6.5

Steam generator feedwater inlet temperature [°C] : 188.7

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 1

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related cables

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : 1

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 14.2

Total battery capacity [Ah] : 8875

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Applicable>

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 1862

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

KR-16

WOLSONG-4

KOREA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SS304L
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: <Not Applicable>
Inside shell diameter [m]	: 7.60
Shell thickness [mm]	: 43.4
Number of pressure channels	: 380
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.19

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: <Not Applicable>
Average fuel enrichment [% of U235]	: 0.71
Refuelling frequency [month]	: 15
Part of the core refuelled [%]	: 96
Average discharge burnup [MWd/t]	: 7296
Active core diameter [m]	: 7.69
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 84
Moderator weight [t]	: 236
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.4
Average core power density [kW/dm <sup>3</sup> ]	: 11.2
Average fuel power density [kW/kgU]	: 23.69
Fuel linear heat generation rate [kW/m]	: 0.1615

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: Gd Injection
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: 180
Operating coolant pressure [MPa]	: 10.5
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 266
Coolant mass flow at the rated power [t/h]	: 8020

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Incoloy 800
SG shell material	: Carbon Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 516
Design heat transfer surface [m2]	: 3197

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 6.7
Design pressure difference [MPa]	: 1.83

### Pressurizer

Total volume [m3]	: 45
Number of safety valves	: <Not Applicable>
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 48480

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.12
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: 0.7
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: 2181.6

### Reactor protection system

Control equipment technology	: <Not Applicable>
Number of independent system divisions	: <Not Applicable>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Applicable>
Number of independent system divisions	: <Not Applicable>

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 4
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 4.59
HP cylinder Inlet steam moisture [%]	: 0.9968
HP cylinder inlet steam temperature [°C]	: 257.5
HP cylinder Inlet steam flow rate [t/h]	: 3584.8

### Main generator

Rated active power [MWe]	: 713
Rated apparent power [MVA]	: 828
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 2



Number of main condensate pumps required for full power : 1

Condenser vacuum at the full power (absolute pressure) [kPa] : 6

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 6.5

Steam generator feedwater inlet temperature [°C] : 188.7

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 1

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water Sprinkler Only

Fire retardant cable coating used for : Safety Related cables

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : 1

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 14.2

Total battery capacity [Ah] : 8875

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Applicable>

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 1862

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

MX-1

LAGUNA VERDE-1

MEXICO

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-GR-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 20.08
Inside shell diameter [m]	: 5.18
Shell thickness [mm]	: 127
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.62
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 444
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 81.02
Moderator weight [t]	: <Not Available>
Number of fuel elements per assembly/bundle	: 92
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 49.15
Average fuel power density [kW/kgU]	: 24.3
Fuel linear heat generation rate [kW/m]	: 14.01

#### Reactivity control

Control rod material	: Boron Carbide
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 109

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.2
Reactor outlet temperature [°C]	: 278
Reactor inlet temperature [°C]	: 217
Coolant mass flow at the rated power [t/h]	: 27900

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 3.35
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Pools

Total containment volume [m3]	: 7447
Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 3
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.15
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 277.2
HP cylinder Inlet steam flow rate [t/h]	: 4280.7

### Main generator

Rated active power [MWe]	: 855
Rated apparent power [MVA]	: 950
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Stainles Steel

Number of main condensate pumps	: 4
Number of main condensate pumps required for full power	: 3
Condenser vacuum at the full power (absolute pressure) [kPa]	: 7.528

**Feedwater system**

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.095
Steam generator feedwater inlet temperature [°C]	: 217

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Greater than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 5
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 2
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 0
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 9.55
Total battery capacity [Ah]	: 7900

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 3177
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-GR-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 20.08
Inside shell diameter [m]	: 5.18
Shell thickness [mm]	: 127
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 29
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.62
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 444
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 81.28
Moderator weight [t]	: <Not Available>
Number of fuel elements per assembly/bundle	: 92
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 49.15
Average fuel power density [kW/kgU]	: 24.3
Fuel linear heat generation rate [kW/m]	: 16.04

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 109

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.2
Reactor outlet temperature [°C]	: 278
Reactor inlet temperature [°C]	: 217
Coolant mass flow at the rated power [t/h]	: 27900

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 3.35
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Pools
Total containment volume [m <sup>3</sup> ]	: 7447

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 3
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.15
HP cylinder Inlet steam moisture [%]	: 0.44
HP cylinder inlet steam temperature [°C]	: 277.2
HP cylinder Inlet steam flow rate [t/h]	: 4280.7

### Main generator

Rated active power [MWe]	: 855
Rated apparent power [MVA]	: 950
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Stainless Steel
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power	: 3
Condenser vacuum at the full power (absolute pressure) [kPa]	: 7.528

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.095
Steam generator feedwater inlet temperature [°C]	: 217

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Greater than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 5
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 2
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 0
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 9.55
Total battery capacity [Ah]	: 7900

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 3177
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

NL-2

BORSSELE

NETHERLANDS

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 22-NiMoCr-37
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 7.5
Inside shell diameter [m]	: 3.81
Shell thickness [mm]	: 185
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4, PCA 2-6
Average fuel enrichment [% of U235]	: 4.4
Refuelling frequency [month]	: 11
Part of the core refuelled [%]	: 23
Average discharge burnup [MWd/t]	: 39000
Active core diameter [m]	: 2.676
Active core height/length [m]	: 2.65
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 38.7
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 205
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 90.2
Average fuel power density [kW/kgU]	: 35.9
Fuel linear heat generation rate [kW/m]	: 20.26

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 200
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 313
Reactor inlet temperature [°C]	: 295.4
Coolant mass flow at the rated power [t/h]	: 36000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	: 22NiMoCr37
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 685
Design heat transfer surface [m <sup>2</sup> ]	: 3600

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 7.750
Design pressure difference [MPa]	: 0.6

### Pressurizer

Total volume [m <sup>3</sup> ]	: 40
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 2000

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Spherical
Containment structure	: Steel
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Spray

Total containment volume [m3]	: 58486
Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.49
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: 11
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	: 200
LPSI system flowrate [t/h]	: 600

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.75
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 272
HP cylinder Inlet steam flow rate [t/h]	: 741

### Main generator

Rated active power [MWe]	: 596
Rated apparent power [MVA]	: 600
Output voltage [kV]	: 21
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium

Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 3

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 3
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 6.9
Steam generator feedwater inlet temperature [°C]	: 210

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

**Fire protection system**

On-site fire suppression/extinguishing system	: Water Sprinkler Only
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 4
Number of on-site safety related diesel generators (available per unit)	: 5
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1
Estimated time reserve of the batteries at full load [h]	: 24
Total installed capacity of the on-site emergency power sources per unit [MW]	: 17
Total battery capacity [Ah]	:

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 463
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 500

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>



Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

PK-2

CHASNUPP-1

PAKISTAN

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-111
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: ER309L SFA5.4 E308L SFA5.9 ER308L SFA5.4 E 308L
Reactor vessel overall length/height [m]	: 9.782
Inside shell diameter [m]	: 3.374
Shell thickness [mm]	: 179
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRCALLOY-4
Average fuel enrichment [% of U235]	: 3.4
Refuelling frequency [month]	: 14
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 30000
Active core diameter [m]	: 2.486
Active core height/length [m]	: 2.9
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 40.746
Moderator weight [t]	: 148.5
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.7
Average core power density [kW/dm <sup>3</sup> ]	: 70.9
Average fuel power density [kW/kgU]	: 27.8
Fuel linear heat generation rate [kW/m]	: 13.59

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE GLASS
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 148.5
Operating coolant pressure [MPa]	: 15.2
Reactor outlet temperature [°C]	: 315.5
Reactor inlet temperature [°C]	: 288.5
Coolant mass flow at the rated power [t/h]	: 24000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	: SA-508-111
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 517.5
Design heat transfer surface [m <sup>2</sup> ]	: 3088.67

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 0.58

### Pressurizer

Total volume [m <sup>3</sup> ]	: 35
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1350

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 49000
Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.26
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.84
LPSI system pressure [MPa]	: 0.78
HPSI system flowrate [t/h]	: 75
LPSI system flowrate [t/h]	: 450

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.34
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 268.3
HP cylinder Inlet steam flow rate [t/h]	: 2015

### Main generator

Rated active power [MWe]	: 325
Rated apparent power [MVA]	: 388
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium

Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.74

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8
Steam generator feedwater inlet temperature [°C]	: 220

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: 2
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Greater than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 4 SBO DGs
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 13.2
Total battery capacity [Ah]	: 2300

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 741
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-111
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SFA5.9 ER308L 309L SFA5.4 E308L E309L
Reactor vessel overall length/height [m]	: 9.782
Inside shell diameter [m]	: 3.374
Shell thickness [mm]	: 179
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRCOLOY-4
Average fuel enrichment [% of U235]	: 3.4
Refuelling frequency [month]	: 14
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 32000
Active core diameter [m]	: 2.486
Active core height/length [m]	: 2.9
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 40.75
Moderator weight [t]	: 148.5
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.7
Average core power density [kW/dm <sup>3</sup> ]	: 70.9
Average fuel power density [kW/kgU]	: 27.8
Fuel linear heat generation rate [kW/m]	: 13.59

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE GLASS
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 148.5
Operating coolant pressure [MPa]	: 15.2
Reactor outlet temperature [°C]	: 315.5
Reactor inlet temperature [°C]	: 288.5
Coolant mass flow at the rated power [t/h]	: 24000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY-800
SG shell material	: SA-508-111
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 517.5
Design heat transfer surface [m2]	: 3088.67

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 0.58

### Pressurizer

Total volume [m3]	: 35
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1350

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: 49000



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.26
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7.84
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 75
LPSI system flowrate [t/h]	: 450

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.34
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 268.1
HP cylinder Inlet steam flow rate [t/h]	: 2015

### Main generator

Rated active power [MWe]	: 340
Rated apparent power [MVA]	: 400
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 5.74

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8
Steam generator feedwater inlet temperature [°C]	: 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: 2
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Greater than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 1 SBO DG
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 9.7
Total battery capacity [Ah]	: 2300

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 741
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: AS304L,A240
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 4.88
Inside shell diameter [m]	: 4.88
Shell thickness [mm]	: 192.5
Number of pressure channels	: 380
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	:

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	:
Average discharge burnup [MWd/t]	: 8650
Active core diameter [m]	: 3.82
Active core height/length [m]	: 4.87
Number of fissile fuel assemblies/bundles	: 2277
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 30.4
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 19
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 8.72
Average fuel power density [kW/kgU]	: 15.5
Fuel linear heat generation rate [kW/m]	: 4.13

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	:
Number of control rod assemblies	: 4

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 10.6
Reactor outlet temperature [°C]	: 293
Reactor inlet temperature [°C]	: 246
Coolant mass flow at the rated power [t/h]	: 6872

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	:
Tube material	: MONEL-400
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.19
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.87
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 248
HP cylinder Inlet steam flow rate [t/h]	: 747

### Main generator

Rated active power [MWe]	: 138.6
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



RO-1

CERNAVODA-1

ROMANIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ZR-NB
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.97
Inside shell diameter [m]	: 7.6
Shell thickness [mm]	: 28.6
Number of pressure channels	: 380
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.34

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zy-4
Average fuel enrichment [% of U235]	: 0.71
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 7100
Active core diameter [m]	: 6.123
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 97.67
Moderator weight [t]	: 242.54
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 11.7
Average fuel power density [kW/kgU]	: 21.1
Fuel linear heat generation rate [kW/m]	: 42.9

#### Reactivity control

Control rod material	: Cadmium SS
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd(NO <sub>3</sub> ) <sub>3</sub> ·6H <sub>2</sub> O
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: Gd Injection
Number of control rod assemblies	: 65

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D <sub>2</sub> O
Coolant weight [t]	: 88.266
Operating coolant pressure [MPa]	: 9.99
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 266.6
Coolant mass flow at the rated power [t/h]	: 27720

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: SB163NiFeCr UNSNo. 8800
SG shell material	: Carbon Steel SA 516gr.70
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 516
Design heat transfer surface [m <sup>2</sup> ]	: 3193

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 5.028
Design pressure difference [MPa]	: 1.87

### Pressurizer

Total volume [m <sup>3</sup> ]	: 45.31
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 48477
Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.1241
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: 1.5
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 4.551
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 258
HP cylinder Inlet steam flow rate [t/h]	: 3481.3

### Main generator

Rated active power [MWe]	: 719.93
Rated apparent power [MVA]	: 800
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Stainles Steel

Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.23

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.8
Steam generator feedwater inlet temperature [°C]	: 187.2

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 4
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 3 chanel, 230V, 50 Hz, 80 kVA each
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 17
Total battery capacity [Ah]	: 7400

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 50000
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: 168000

**Non-electrical applications**

Primary heat connection	: Main Steam
Number of heat connection points per unit	: 1

Number of intermediate circuits/heat exchangers	: 2
Total capacity of heat connections [MWt]	: 46.5
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Horizontal
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ZR-NB
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 5.97
Inside shell diameter [m]	: 7.6
Shell thickness [mm]	: 28.6
Number of pressure channels	: 380
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4.34

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: D <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zy-4
Average fuel enrichment [% of U235]	: 0.71
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 7100
Active core diameter [m]	: 6.123
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 97.67
Moderator weight [t]	: 242.54
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 11.7
Average fuel power density [kW/kgU]	: 21.1
Fuel linear heat generation rate [kW/m]	: 42.9

#### Reactivity control

Control rod material	: Cadmium SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd(NO <sub>3</sub> ) <sub>3</sub> x6H <sub>2</sub> O
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: Gd Injection
Number of control rod assemblies	: 65

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D <sub>2</sub> O
Coolant weight [t]	: 82.266
Operating coolant pressure [MPa]	: 9.99
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 266.6
Coolant mass flow at the rated power [t/h]	: 27720

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: SB163NiFeCrUNNo.8800
SG shell material	: Carbon Steel SA516gr.70
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 516
Design heat transfer surface [m <sup>2</sup> ]	: 3193

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 5.028
Design pressure difference [MPa]	: 1.87

### Pressurizer

Total volume [m <sup>3</sup> ]	: 45.31
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m <sup>3</sup> ]	: 48477

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.1241
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 4.42
LPSI system pressure [MPa]	: 1.5
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 4.551
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 258
HP cylinder Inlet steam flow rate [t/h]	: 3481.3

### Main generator

Rated active power [MWe]	: 719.93
Rated apparent power [MVA]	: 800
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Stainles Steel
Number of main condensate pumps	: 3



Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.23

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.8
Steam generator feedwater inlet temperature [°C]	: 187.2

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 2
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 3 Channels, 230V, 50Hz, 80kVa each
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 17
Total battery capacity [Ah]	: 7400

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 50000
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: 168000

### Non-electrical applications

Primary heat connection	: Main Steam
Number of heat connection points per unit	: 1
Number of intermediate circuits/heat exchangers	: 2

Total capacity of heat connections [MWt]	: 46.5
Extraction steam pressure [MPa]	: <Not Applicable>

RU-96

BALAKOVO-1

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>

Number of main condensate pumps	:
Number of main condensate pumps required for full power	:
Condenser vacuum at the full power (absolute pressure) [kPa]	:

**Feedwater system**

Number of turbine driven main feedwater pumps	: 3
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.6
Steam generator feedwater inlet temperature [°C]	: 220

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 5
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	:
Cable segregation within the unit used for	:
On-site fire brigade	:
Off-site fire brigade response time	:

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 2
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 18.9
Total battery capacity [Ah]	: 1500

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-97

BALAKOVO-2

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-98

BALAKOVO-3

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-99

BALAKOVO-4

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m <sup>2</sup> ]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m <sup>3</sup> ]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m <sup>3</sup> ]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-21

BELOYARSK-3

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: <Not Available>
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: CH18N10
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 12.6
Inside shell diameter [m]	: 12.86
Shell thickness [mm]	: 30
Number of pressure channels	:
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	:

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: <Not Available>
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB, SS
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 5
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 100000
Active core diameter [m]	: 2.05
Active core height/length [m]	: 1.03
Number of fissile fuel assemblies/bundles	: 369
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	:
Fuel weight [t]	: 12.1
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 127
Fuel clad thickness [mm]	: 0.4
Average core power density [kW/dm <sup>3</sup> ]	: 413
Average fuel power density [kW/kgU]	: 136
Fuel linear heat generation rate [kW/m]	: 38

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	:
Number of control rod assemblies	: 19

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: Na
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 8.8
Reactor outlet temperature [°C]	: 550
Reactor inlet temperature [°C]	: 377
Coolant mass flow at the rated power [t/h]	: 25000

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: ICR2MO
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:



Number of containment spray pumps	:
Containment design pressure [MPa]	:
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 3
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 13
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 500
HP cylinder Inlet steam flow rate [t/h]	: 540

### Main generator

Rated active power [MWe]	: 200
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-141

BILIBINO-1

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: CR18NI10TI
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 3
Inside shell diameter [m]	: 4.1
Shell thickness [mm]	: -
Number of pressure channels	: -
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO2
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: SS
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 3000
Active core diameter [m]	: 4.1
Active core height/length [m]	: 3
Number of fissile fuel assemblies/bundles	: 273
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 7.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 6
Fuel clad thickness [mm]	: -
Average core power density [kW/dm <sup>3</sup> ]	: 1.8
Average fuel power density [kW/kgU]	: 18
Fuel linear heat generation rate [kW/m]	: 27

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 6
Reactor outlet temperature [°C]	: 280
Reactor inlet temperature [°C]	: 253
Coolant mass flow at the rated power [t/h]	: 630

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 6
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: <Not Available>
Number of pumps per RCS loop	: <Not Available>
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Available>
Containment structure	: <Not Applicable>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 100

### Main generator

Rated active power [MWe]	: 12
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



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BILIBINO-2

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: CR18NI10TI
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 3
Inside shell diameter [m]	: 4.1
Shell thickness [mm]	: -
Number of pressure channels	: -
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: SS
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 3000
Active core diameter [m]	: 4.1
Active core height/length [m]	: 3
Number of fissile fuel assemblies/bundles	: 273
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 7.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 6
Fuel clad thickness [mm]	: 0.6
Average core power density [kW/dm <sup>3</sup> ]	: 1.8
Average fuel power density [kW/kgU]	: 18
Fuel linear heat generation rate [kW/m]	: 27

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 6
Reactor outlet temperature [°C]	: 280
Reactor inlet temperature [°C]	: 253
Coolant mass flow at the rated power [t/h]	: 630

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 6
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: <Not Available>
Number of pumps per RCS loop	: <Not Available>
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Available>
Containment structure	: <Not Applicable>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 100

### Main generator

Rated active power [MWe]	: 12
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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BILIBINO-3

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: CR18NI10TI
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 3
Inside shell diameter [m]	: 4.1
Shell thickness [mm]	: -
Number of pressure channels	: -
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: SS
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 3000
Active core diameter [m]	: 4.1
Active core height/length [m]	: 3
Number of fissile fuel assemblies/bundles	: 273
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 7.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 6
Fuel clad thickness [mm]	: 0.6
Average core power density [kW/dm <sup>3</sup> ]	: 1.8
Average fuel power density [kW/kgU]	: 18
Fuel linear heat generation rate [kW/m]	: 27

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 6
Reactor outlet temperature [°C]	: 280
Reactor inlet temperature [°C]	: 253
Coolant mass flow at the rated power [t/h]	: 630

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 6
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: <Not Available>
Number of pumps per RCS loop	: <Not Available>
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Available>
Containment structure	: <Not Applicable>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m <sup>3</sup> ]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 100

### Main generator

Rated active power [MWe]	: 12
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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BILIBINO-4

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: CR18NI10TI
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 3
Inside shell diameter [m]	: 4.1
Shell thickness [mm]	: -
Number of pressure channels	: -
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: SS
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 3000
Active core diameter [m]	: 4.1
Active core height/length [m]	: 3
Number of fissile fuel assemblies/bundles	: 273
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 7.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 6
Fuel clad thickness [mm]	: 0.6
Average core power density [kW/dm <sup>3</sup> ]	: 1.8
Average fuel power density [kW/kgU]	: 18
Fuel linear heat generation rate [kW/m]	: 27

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 6
Reactor outlet temperature [°C]	: 280
Reactor inlet temperature [°C]	: 253
Coolant mass flow at the rated power [t/h]	: 630

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 6
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: <Not Available>
Number of pumps per RCS loop	: <Not Available>
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Available>
Containment structure	: <Not Applicable>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 100

### Main generator

Rated active power [MWe]	: 12
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-30

KALININ-1

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-31

KALININ-2

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-36

KALININ-3

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m <sup>2</sup> ]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m <sup>3</sup> ]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m <sup>3</sup> ]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-37

KALININ-4

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: 306
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 1.05
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-12

KOLA-1

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 23Ni,13Cr - 1 layer, 19Ni,9Cr - 3 other layers
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 28600
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 83
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 300
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 6
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: 250
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.4

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



RU-13

KOLA-2

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 23Ni,13Cr - 1 layer, 19Ni,9Cr - 3 other layers
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 28600
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 83
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 300
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 6
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: 250
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.4

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-32

KOLA-3

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 23Ni,13Cr - 1 layer, 19Ni,9Cr - 3 other layers
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 28600
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 83
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 300
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 6
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: 250
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:



Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.4

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-33

KOLA-4

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 23Ni,13Cr - 1 layer, 19Ni,9Cr - 3 other layers
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 28600
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 83
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 300
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 6
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: 250
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.4

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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KURSK-1

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.08
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 10000
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1693
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 11.2

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 138

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: -
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Available>
Containment structure	: <Not Applicable>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.08
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 10000
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1693
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 11.2

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 150

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: -
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Available>
Containment structure	: <Not Applicable>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.08
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 10000
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1661
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 16

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 170

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: -
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-39

KURSK-4

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.08
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 10000
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1661
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 16

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 167

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: -
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-15

LENINGRAD-1

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.04
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 22000
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1661
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 18
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 14.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 211

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: -
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Available>
Containment structure	: <Not Applicable>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



RU-16

LENINGRAD-2

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.04
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 22000
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1661
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 18
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 14.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 211

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: -
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Available>
Containment structure	: <Not Applicable>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-34

LENINGRAD-3

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.04
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 22000
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1661
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 18
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 14.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 211

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: -
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-35

LENINGRAD-4

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.04
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR+1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 22000
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1661
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 18
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 14.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 211

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: -
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 28600
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 83
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 295.8
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 6
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-11

NOVOVORONEZH-4

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 28600
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 83
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 295.8
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 229.2
Design heat transfer surface [m2]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 6
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-20

NOVOVORONEZH-5

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 331
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 109

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 324
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: -

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: <Not Available>
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.5
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	:
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-59

ROSTOV-1

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 84800

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-62

ROSTOV-2

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: -
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 0.7
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 84800

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



RU-23

SMOLENSK-1

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.04
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 22200
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1661
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 18
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 14.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 175

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-24

SMOLENSK-2

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.04
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 22200
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1661
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 18
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 14.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 175

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

RU-67

SMOLENSK-3

RUSSIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: -
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 7
Inside shell diameter [m]	: 0.04
Shell thickness [mm]	: 4
Number of pressure channels	: -
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 22200
Active core diameter [m]	: 11.8
Active core height/length [m]	: 7
Number of fissile fuel assemblies/bundles	: 1661
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 18
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 103
Average fuel power density [kW/kgU]	: 19.4
Fuel linear heat generation rate [kW/m]	: 14.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 175

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 270
Coolant mass flow at the rated power [t/h]	: 37500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: 4
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: -
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.4
HP cylinder Inlet steam flow rate [t/h]	: 2890

### Main generator

Rated active power [MWe]	: 500
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

SK-13

BOHUNICE-3

SLOVAKIA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: E-110 (Zr+1%Nb)
Average fuel enrichment [% of U235]	: 4.87
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 19
Average discharge burnup [MWd/t]	: 57500
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 43.85
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.685
Average core power density [kW/dm <sup>3</sup> ]	: 90.4
Average fuel power density [kW/kgU]	: 33.5
Fuel linear heat generation rate [kW/m]	: 13.38

#### Reactivity control



Control rod material	: Boron SS
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 120.5
Operating coolant pressure [MPa]	: 12.0
Reactor outlet temperature [°C]	: 298.8
Reactor inlet temperature [°C]	: 267.4
Coolant mass flow at the rated power [t/h]	: 42600

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 245.2
Design heat transfer surface [m <sup>2</sup> ]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 2
Design pressure difference [MPa]	: 0.42

### Pressurizer

Total volume [m <sup>3</sup> ]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: Rectangular
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Spray

Total containment volume [m3]	: 50000
Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 13
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 13
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 300

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.512
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 256
HP cylinder Inlet steam flow rate [t/h]	: 1360

### Main generator

Rated active power [MWe]	: 253
Rated apparent power [MVA]	: 273
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 2
Condenser tube material	: Brass

Number of main condensate pumps	: 6
Number of main condensate pumps required for full power	: 4
Condenser vacuum at the full power (absolute pressure) [kPa]	: 12

#### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 5
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 6.6
Steam generator feedwater inlet temperature [°C]	: 223

#### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

#### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

#### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 8.4
Total battery capacity [Ah]	: 4800

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 379
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 7056

#### Non-electrical applications

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 2

Number of intermediate circuits/heat exchangers	: 2
Total capacity of heat connections [MWt]	: 147
Extraction steam pressure [MPa]	: 1.451

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: E-110 (Zr+1%Nb)
Average fuel enrichment [% of U235]	: 4.87
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 19
Average discharge burnup [MWd/t]	: 57500
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 43.85
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.685
Average core power density [kW/dm <sup>3</sup> ]	: 90.4
Average fuel power density [kW/kgU]	: 33.5
Fuel linear heat generation rate [kW/m]	: 13.38

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 120.5
Operating coolant pressure [MPa]	: 12.0
Reactor outlet temperature [°C]	: 298.8
Reactor inlet temperature [°C]	: 267.4
Coolant mass flow at the rated power [t/h]	: 42600

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 245.2
Design heat transfer surface [m <sup>2</sup> ]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 2
Design pressure difference [MPa]	: 0.42

### Pressurizer

Total volume [m <sup>3</sup> ]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: Rectangular
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 50000

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 13
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 13
LPSI system pressure [MPa]	: 0.9
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 300

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.512
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 256
HP cylinder Inlet steam flow rate [t/h]	: 1360

### Main generator

Rated active power [MWe]	: 253
Rated apparent power [MVA]	: 273
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 2
Condenser tube material	: Brass
Number of main condensate pumps	: 6

Number of main condensate pumps required for full power	: 4
Condenser vacuum at the full power (absolute pressure) [kPa]	: 12

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 5
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 6.6
Steam generator feedwater inlet temperature [°C]	: 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 4
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 8.4
Total battery capacity [Ah]	: 4800

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 379
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 7056

### Non-electrical applications

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 2
Number of intermediate circuits/heat exchangers	: 2



Total capacity of heat connections [MWt]	: 147
Extraction steam pressure [MPa]	: 1.451

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: E-110 (Zr+1%Nb)
Average fuel enrichment [% of U235]	: 4.87
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 19
Average discharge burnup [MWd/t]	: 57200
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 44
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.685
Average core power density [kW/dm <sup>3</sup> ]	: 90.2
Average fuel power density [kW/kgU]	: 33.44
Fuel linear heat generation rate [kW/m]	: 13.54

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 240
Operating coolant pressure [MPa]	: 12.0
Reactor outlet temperature [°C]	: 298.8
Reactor inlet temperature [°C]	: 267.4
Coolant mass flow at the rated power [t/h]	: 42600

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 245.2
Design heat transfer surface [m <sup>2</sup> ]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.6
Design pressure difference [MPa]	: 0.45

### Pressurizer

Total volume [m <sup>3</sup> ]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: Rectangular
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 52519

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 5
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 13.5
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 800

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.32
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 256
HP cylinder Inlet steam flow rate [t/h]	: 1270

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: 259
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 2
Condenser tube material	: Brass
Number of main condensate pumps	: 6

Number of main condensate pumps required for full power : 4

Condenser vacuum at the full power (absolute pressure) [kPa] : 8

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : <Not Applicable>

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.4

Total battery capacity [Ah] : 4500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 657

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : <Not Applicable>

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: E-110 (Zr+1%Nb)
Average fuel enrichment [% of U235]	: 4.87
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 19
Average discharge burnup [MWd/t]	: 57200
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 44
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.685
Average core power density [kW/dm <sup>3</sup> ]	: 90.2
Average fuel power density [kW/kgU]	: 33.44
Fuel linear heat generation rate [kW/m]	: 13.54

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: 3,35%Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 240
Operating coolant pressure [MPa]	: 12.0
Reactor outlet temperature [°C]	: 298.8
Reactor inlet temperature [°C]	: 267.4
Coolant mass flow at the rated power [t/h]	: 42600

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: Saturated Steam
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 245.2
Design heat transfer surface [m <sup>2</sup> ]	: 2620

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 1.6
Design pressure difference [MPa]	: 0.45

### Pressurizer

Total volume [m <sup>3</sup> ]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: Rectangular
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 52519



Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.15
Design leakage rate [% per day]	: 5
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 3
Number of hydroaccumulators	: 4
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 13.5
LPSI system pressure [MPa]	: 0.8
HPSI system flowrate [t/h]	: 65
LPSI system flowrate [t/h]	: 800

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 3

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 3

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 4.32
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 256
HP cylinder Inlet steam flow rate [t/h]	: 1270

### Main generator

Rated active power [MWe]	: 235
Rated apparent power [MVA]	: 259
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 2
Condenser tube material	: Brass
Number of main condensate pumps	: 6

Number of main condensate pumps required for full power : 4

Condenser vacuum at the full power (absolute pressure) [kPa] : 8

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 5

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 4

Feedwater discharge pressure [MPa] : 6.6

Steam generator feedwater inlet temperature [°C] : 223

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related + Other systems

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : <Not Applicable>

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 8.4

Total battery capacity [Ah] : 4500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 657

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) : <Not Applicable>

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: SA 533 GR.B, CLASS 1.
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 11.9
Inside shell diameter [m]	: 3.35
Shell thickness [mm]	: 168
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: 4.8
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 46
Average discharge burnup [MWd/t]	: 44029
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 50
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 235
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 108.7
Average fuel power density [kW/kgU]	: 37.56
Fuel linear heat generation rate [kW/m]	: 17.62

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: 1.1X IFBA, 1.4X IFBA
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 197
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 325.2
Reactor inlet temperature [°C]	: 286.7
Coolant mass flow at the rated power [t/h]	: 28774

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 690TT
SG shell material	: Carbon Steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m <sup>2</sup> ]	: 7177

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.2
Design pressure difference [MPa]	: 1.6

### Pressurizer

Total volume [m <sup>3</sup> ]	: 28.3
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 1000

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 40000
Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.309
Design leakage rate [% per day]	: 0.2
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 17.1
LPSI system pressure [MPa]	: 4.1
HPSI system flowrate [t/h]	: 100
LPSI system flowrate [t/h]	: 460

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.13
HP cylinder Inlet steam moisture [%]	: 0.47
HP cylinder inlet steam temperature [°C]	: 278.1
HP cylinder Inlet steam flow rate [t/h]	: 3931

### Main generator

Rated active power [MWe]	: 730
Rated apparent power [MVA]	: 813
Output voltage [kV]	: 21
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: -

Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 3
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.9

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 6.67
Steam generator feedwater inlet temperature [°C]	: 222.5

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

**Fire protection system**

On-site fire suppression/extinguishing system	: Water Sprinkler Only
Fire retardant cable coating used for	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 4
Total installed capacity of the on-site emergency power sources per unit [MW]	: 7
Total battery capacity [Ah]	: 2080

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1694
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>



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## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA508 CLASS3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: AISI-309/308
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 3.98
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.9
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 46000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.73
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.0057
Average core power density [kW/dm <sup>3</sup> ]	: 102.8
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Zirconium Diboride (GdO <sub>3</sub> , ZrB <sub>2</sub> )
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 32

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 202
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 314.9
Reactor inlet temperature [°C]	: 276.9
Coolant mass flow at the rated power [t/h]	: 48481.2

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: SA 533 grade B, class I (Stainless steel)
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 309.433
Design heat transfer surface [m <sup>2</sup> ]	: 4699

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.3
Design pressure difference [MPa]	: <Not Available>

### Pressurizer

Total volume [m <sup>3</sup> ]	: 40.33
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Other - Residual Heat removal via heat exchangers

Total containment volume [m3]	: 58000
Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.5
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12
LPSI system pressure [MPa]	: 1
HPSI system flowrate [t/h]	: 153
LPSI system flowrate [t/h]	: 710

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.5
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 5439.6

### Main generator

Rated active power [MWe]	: <Not Available>
Rated apparent power [MVA]	: 1120
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -

Number of main condensate pumps	: -
Number of main condensate pumps required for full power	: -
Condenser vacuum at the full power (absolute pressure) [kPa]	: -

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	: -
Feedwater discharge pressure [MPa]	: -
Steam generator feedwater inlet temperature [°C]	: -

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

**Fire protection system**

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: -
Number of on site non-safety related gas turbines	: -
Other on-site emergency AC power sources	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1511
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Available>

**Non-electrical applications**

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA508 CLASS 3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: AISI-309/308
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 3.98
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 3.9
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 46000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.73
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.0057
Average core power density [kW/dm <sup>3</sup> ]	: 102.8
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Zirconium Diboride (GdO <sub>3</sub> , ZrB <sub>2</sub> )
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 32

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 202
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 314.9
Reactor inlet temperature [°C]	: 276.9
Coolant mass flow at the rated power [t/h]	: 48481.2

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: SA 533 grade B, class I (Stainless steel)
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 309.433
Design heat transfer surface [m <sup>2</sup> ]	: 4699

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.3
Design pressure difference [MPa]	: <Not Available>

### Pressurizer

Total volume [m <sup>3</sup> ]	: 40.33
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 1440

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Other - Residual Heat removal via heat exchangers
Total containment volume [m <sup>3</sup> ]	: 58000

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.5
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12
LPSI system pressure [MPa]	: 1
HPSI system flowrate [t/h]	: 153
LPSI system flowrate [t/h]	: 710

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 5.5
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 272
HP cylinder Inlet steam flow rate [t/h]	: 4980

### Main generator

Rated active power [MWe]	: 945
Rated apparent power [MVA]	: 1072
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 3



Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.3

### Feedwater system

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 1
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 6.32
Steam generator feedwater inlet temperature [°C]	: 219

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	:
Total installed capacity of the on-site emergency power sources per unit [MW]	:
Total battery capacity [Ah]	:

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1511
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>
Number of intermediate circuits/heat exchangers	: <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

ES-6

ALMARAZ-1

SPAIN

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: -
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: AS-304SS
Reactor vessel overall length/height [m]	: 13.2
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zirlo
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 58000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 102
Average fuel power density [kW/kgU]	: 37.07
Fuel linear heat generation rate [kW/m]	: 17.3

#### Reactivity control

Control rod material	: Cadmium Alloy
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GADOLINIA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 291.7
Coolant mass flow at the rated power [t/h]	: 21500

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY 800-M
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 39.64
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: -

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: -

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.9
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 5365

### Main generator

Rated active power [MWe]	: 981
Rated apparent power [MVA]	: 1034
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium

Number of main condensate pumps	: -
Number of main condensate pumps required for full power	: -
Condenser vacuum at the full power (absolute pressure) [kPa]	: -

**Feedwater system**

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: -
Feedwater discharge pressure [MPa]	: -
Steam generator feedwater inlet temperature [°C]	: -

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 2
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: <Not Applicable>
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: -
Number of on site non-safety related gas turbines	: -
Other on-site emergency AC power sources	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1804
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	:
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: AS-304SS
Reactor vessel overall length/height [m]	: 13.2
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zirlo
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 101.4
Average fuel power density [kW/kgU]	: 37.07
Fuel linear heat generation rate [kW/m]	: 17.3

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GADOLINIA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 49

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 291.7
Coolant mass flow at the rated power [t/h]	: 21500

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCOLOY 800-M
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 39.64
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	:

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Spray
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 3.5
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	:

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	:

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.9
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 5365

### Main generator

Rated active power [MWe]	: 980
Rated apparent power [MVA]	: 1034
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 1

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 2

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : <Not Applicable>

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1804

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : <Not Applicable>

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 12.98
Inside shell diameter [m]	: 4.002
Shell thickness [mm]	: 198.3
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 28
Average discharge burnup [MWd/t]	: 50500
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.47
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 110.74
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 18.92

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.72
Reactor outlet temperature [°C]	: 326.7
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 15890

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 40
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Other - relief valves
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 3.86
Design leakage rate [% per day]	: 0.05
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 1528

### Main generator

Rated active power [MWe]	: 930
Rated apparent power [MVA]	: 930
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power : 3

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 1

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 2

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1421

Interim storage facility type : Dry

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>



Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 12.98
Inside shell diameter [m]	: 4.007
Shell thickness [mm]	: 198
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	:
Average discharge burnup [MWd/t]	: 50500
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.47
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 110.74
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 18.92

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.72
Reactor outlet temperature [°C]	: 327
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 15890

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.8
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 39.6
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Other - relief valves
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 3.86
Design leakage rate [% per day]	: 0.05
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 1528

### Main generator

Rated active power [MWe]	: 930
Rated apparent power [MVA]	: 930
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power : 3

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 2

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 1

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : 2

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1421

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ST SA-533 Gr B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 2.39
Inside shell diameter [m]	: 5.53
Shell thickness [mm]	: 136
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 4
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 41
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 4.29
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 624
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 111.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 92
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 52.53
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 20.03

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 145

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.26
Reactor outlet temperature [°C]	: 288
Reactor inlet temperature [°C]	: 280
Coolant mass flow at the rated power [t/h]	: 38300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 4.77
Design pressure difference [MPa]	: 1.824

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 28838



Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.103
Design leakage rate [% per day]	: 0.3
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 3
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 1
HPSI systems pressure [MPa]	: 7.91
LPSI system pressure [MPa]	: 3.43
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 7.115
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 284.6
HP cylinder Inlet steam flow rate [t/h]	: 1494.4

### Main generator

Rated active power [MWe]	: 1080
Rated apparent power [MVA]	: 1082.5
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: <Not Available>
Number of condensers per turbine-generator	: 1
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation :

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: S-20MN- MO-NI 55
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS 1.4550
Reactor vessel overall length/height [m]	: 10.689
Inside shell diameter [m]	: 4.878
Shell thickness [mm]	: 245
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: 4.20
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 22.6
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.44
Active core height/length [m]	: 3.4
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82.8
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.725
Average core power density [kW/dm <sup>3</sup> ]	:
Average fuel power density [kW/kgU]	: 36.34
Fuel linear heat generation rate [kW/m]	: 20.71

#### Reactivity control

Control rod material	: Carbon Steel
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: In(15%)/Ag(80%)/Cd(5%)
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 52

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: 240
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 325.9
Reactor inlet temperature [°C]	: 294.3
Coolant mass flow at the rated power [t/h]	: 59806.8

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: Incoloy-800
SG shell material	: 20 MnMoNi 55
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 1009.3
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 9.870
Design pressure difference [MPa]	: 0.66

### Pressurizer

Total volume [m3]	: 45.2
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1638

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	:

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: 0.538
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	: Active + Passive

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: 6
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	:
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 278.12
HP cylinder Inlet steam flow rate [t/h]	: 5604

### Main generator

Rated active power [MWe]	: 1066
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Applicable>

Number of diesel driven pumps : 4

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 3

Number of on-site safety related diesel generators (available per unit) : 4

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CS
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: AS
Reactor vessel overall length/height [m]	: 12.34
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: 4.5
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 50500
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: 129.62
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 110.74
Average fuel power density [kW/kgU]	: 38
Fuel linear heat generation rate [kW/m]	: 18.92

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 129.62
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 328.3
Reactor inlet temperature [°C]	: 291.6
Coolant mass flow at the rated power [t/h]	: 49404

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600TT
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m <sup>2</sup> ]	: 4929.3

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.6
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m <sup>3</sup> ]	: 39.64
Number of safety valves	: 3
Number of relief valves	: 2
Installed heater power [kW]	: 1400

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: Vacuum Building
Total containment volume [m <sup>3</sup> ]	: 62300

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	:
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: 3
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 15.8
LPSI system pressure [MPa]	: 2.4
HPSI system flowrate [t/h]	: 670
LPSI system flowrate [t/h]	: 24

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.8
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 332
HP cylinder Inlet steam flow rate [t/h]	: 5545

### Main generator

Rated active power [MWe]	: 1080
Rated apparent power [MVA]	: 36
Output voltage [kV]	: 21
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 3.5

**Feedwater system**

Number of turbine driven main feedwater pumps	: 2
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.6
Steam generator feedwater inlet temperature [°C]	: 226

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: 1

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: <Not Available>
Cable segregation within the unit used for	: <Not Available>
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: <Not Available>

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 2
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: <Not Available>
Total battery capacity [Ah]	: <Not Available>

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1594
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

SE-9

FORSMARK-1

SWEDEN

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SIS 2333
Reactor vessel overall length/height [m]	: 21.45
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 160
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.60
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 17
Average discharge burnup [MWd/t]	: 43170
Active core diameter [m]	: 4.51
Active core height/length [m]	: 3.68
Number of fissile fuel assemblies/bundles	: 676
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 123.4
Moderator weight [t]	: 247
Number of fuel elements per assembly/bundle	: 96
Fuel clad thickness [mm]	: 0.605
Average core power density [kW/dm <sup>3</sup> ]	: 45.9
Average fuel power density [kW/kgU]	: 23.1
Fuel linear heat generation rate [kW/m]	: 14.1

#### Reactivity control

Control rod material	: Boron Carbide
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: UO <sub>2</sub> -Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 161

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 247
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 273.5
Coolant mass flow at the rated power [t/h]	: 35100

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 0.83
Design pressure difference [MPa]	: 0.125

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray

Total containment volume [m3]	: 9850
Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.55
Design leakage rate [% per day]	: 1
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 7
LPSI system pressure [MPa]	: 1.2
HPSI system flowrate [t/h]	: 81
LPSI system flowrate [t/h]	: 446

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 4360

### Main generator

Rated active power [MWe]	: 466
Rated apparent power [MVA]	: 635
Output voltage [kV]	: 21.5
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium



Number of main condensate pumps	: 3
Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 3.9

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 8.42
Steam generator feedwater inlet temperature [°C]	: <Not Applicable>

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Applicable>
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: No cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Dedicated Full Time Fire Brigade
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 4
Number of on-site safety related gas turbines (available per unit)	: 1
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: <Not Applicable>
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 6.4
Total battery capacity [Ah]	: <Not Applicable>

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SIS 2333
Reactor vessel overall length/height [m]	: 21.45
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 160
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3.60
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 42000
Active core diameter [m]	: 4.51
Active core height/length [m]	: 3.75
Number of fissile fuel assemblies/bundles	: 676
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 122.3
Moderator weight [t]	: 247
Number of fuel elements per assembly/bundle	: 100
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 45.9
Average fuel power density [kW/kgU]	: 22.4
Fuel linear heat generation rate [kW/m]	: 16.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 161

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 247
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 273.5
Coolant mass flow at the rated power [t/h]	: 4700

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: <Not Available>
Pump motor rating [MW]	: 0.83
Design pressure difference [MPa]	: 0.125

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 9850

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.55
Design leakage rate [% per day]	: 1
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 4
HPSI systems pressure [MPa]	: 10
LPSI system pressure [MPa]	: 1.6
HPSI system flowrate [t/h]	: 81
LPSI system flowrate [t/h]	: 446

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 4360

### Main generator

Rated active power [MWe]	: 466
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA508B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SIS 2333
Reactor vessel overall length/height [m]	: 9.8
Inside shell diameter [m]	: 3.94
Shell thickness [mm]	: 181
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2,FE-ZR LINER
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 16.3
Average discharge burnup [MWd/t]	: 43220
Active core diameter [m]	: 4.6
Active core height/length [m]	: 3.68
Number of fissile fuel assemblies/bundles	: 700
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 123.4
Moderator weight [t]	: 250
Number of fuel elements per assembly/bundle	: 91
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 48.5
Average fuel power density [kW/kgU]	: 24.5
Fuel linear heat generation rate [kW/m]	: 14.9

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 169

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 250
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 273.5
Coolant mass flow at the rated power [t/h]	: 5130

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 0.632
Design pressure difference [MPa]	: 0.24

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 11500

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.6
Design leakage rate [% per day]	: 1
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: 4
HPSI systems pressure [MPa]	: 10
LPSI system pressure [MPa]	: 1.5
HPSI system flowrate [t/h]	: 81
LPSI system flowrate [t/h]	: 1278

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.45
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 5846

### Main generator

Rated active power [MWe]	: 1200
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: -
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 17.6
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 125
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 2.5
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.67
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 448
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 90
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 96
Fuel clad thickness [mm]	: 0.60
Average core power density [kW/dm <sup>3</sup> ]	: 36
Average fuel power density [kW/kgU]	: 17.4
Fuel linear heat generation rate [kW/m]	: 9.70

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 112

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 274
Coolant mass flow at the rated power [t/h]	: 16600

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 0.98
Design pressure difference [MPa]	: 0.045

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 5500

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 5.0
Design leakage rate [% per day]	: 1.0
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 1
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 7.5
LPSI system pressure [MPa]	: 0.2
HPSI system flowrate [t/h]	: 108
LPSI system flowrate [t/h]	: 1300

### Reactor protection system

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital/Analog
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 5
HP cylinder inlet steam pressure [MPa]	: 6.8
HP cylinder Inlet steam moisture [%]	: 0.20
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 2300

### Main generator

Rated active power [MWe]	: 487
Rated apparent power [MVA]	: 572
Output voltage [kV]	: 21.4
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 4
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 3

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.3

Steam generator feedwater inlet temperature [°C] : <Not Applicable>

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related cables

Cable segregation within the unit used for : Safety Related cables

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 2

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 4

Number of on-site safety related gas turbines (available per unit) : 2

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : <Not Applicable>

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : 35

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 969

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 3659

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>



Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-308
Reactor vessel overall length/height [m]	: 20
Inside shell diameter [m]	: 5.5
Shell thickness [mm]	: 150
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.63
Active core height/length [m]	: 3.72
Number of fissile fuel assemblies/bundles	: 444
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 96
Fuel clad thickness [mm]	: 0.605
Average core power density [kW/dm <sup>3</sup> ]	: 47
Average fuel power density [kW/kgU]	: 22.1
Fuel linear heat generation rate [kW/m]	: 12.3

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 109

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 274
Coolant mass flow at the rated power [t/h]	: 27700

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m3]	: -

Number of containment spray pumps	: 2
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: 1.0
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: 2
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.8
HP cylinder Inlet steam moisture [%]	: 0.02
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 3310

### Main generator

Rated active power [MWe]	: 630
Rated apparent power [MVA]	: 707
Output voltage [kV]	: 21
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 2

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : 2

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : 2

Total installed capacity of the on-site emergency power sources per unit [MW] : 35

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 700

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 3659

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-305
Reactor vessel overall length/height [m]	: 20.8
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 160
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: 3
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 32000
Active core diameter [m]	: 4.6
Active core height/length [m]	: 3.68
Number of fissile fuel assemblies/bundles	: 700
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 126
Moderator weight [t]	: 250
Number of fuel elements per assembly/bundle	: 96
Fuel clad thickness [mm]	: 0.60
Average core power density [kW/dm <sup>3</sup> ]	: 54
Average fuel power density [kW/kgU]	: 24.1
Fuel linear heat generation rate [kW/m]	: 14.0

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 169

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 250
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 288
Reactor inlet temperature [°C]	: 277
Coolant mass flow at the rated power [t/h]	: 41000

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m <sup>2</sup> ]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 0.63
Design pressure difference [MPa]	: 0.37

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray
Total containment volume [m <sup>3</sup> ]	: 8500



Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 6
Design leakage rate [% per day]	: 1.0
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: 4
HPSI systems pressure [MPa]	: 10
LPSI system pressure [MPa]	: 1.5
HPSI system flowrate [t/h]	: 324
LPSI system flowrate [t/h]	: 5100

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.7
HP cylinder Inlet steam moisture [%]	: 0.18
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 5832

### Main generator

Rated active power [MWe]	: 1205
Rated apparent power [MVA]	: 1295
Output voltage [kV]	: 20.5
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 3

Number of main condensate pumps required for full power : 2

Condenser vacuum at the full power (absolute pressure) [kPa] : 7

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : 1

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.95

Steam generator feedwater inlet temperature [°C] : <Not Applicable>

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for : Safety Related cables

Cable segregation within the unit used for : Safety Related + Other systems

On-site fire brigade : Dedicated Full Time Fire Brigade

Off-site fire brigade response time : Less than 30 min.

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 4

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources : <Not Applicable>

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : 10.8

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 1040

Interim storage facility type : Wet

Interim storage facility capacity (number of spent fuel assemblies) : 3659

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: <Not Applicable>

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA- 533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-18-8
Reactor vessel overall length/height [m]	: 20
Inside shell diameter [m]	: 6
Shell thickness [mm]	: 150
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 15
Average discharge burnup [MWd/t]	: 41000
Active core diameter [m]	: 4.39
Active core height/length [m]	: 3.68
Number of fissile fuel assemblies/bundles	: 648
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 112
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 83
Fuel clad thickness [mm]	: 0.605
Average core power density [kW/dm <sup>3</sup> ]	: 48
Average fuel power density [kW/kgU]	: 21.9
Fuel linear heat generation rate [kW/m]	: 28

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Boron/Hafmium
Burnable neutron absorber material specification	: B-4C,HF
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 157

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 272
Coolant mass flow at the rated power [t/h]	: 41580

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.66
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: 4072

### Main generator

Rated active power [MWe]	: 450
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA- 533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.3
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: MS
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 24
Average discharge burnup [MWd/t]	: 47000
Active core diameter [m]	: 3
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 99.9
Average fuel power density [kW/kgU]	: 34
Fuel linear heat generation rate [kW/m]	: 22.02

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 32

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 322.4
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 50600

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5.25
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.1
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: 4640

### Main generator

Rated active power [MWe]	: 458
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-2
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-305
Reactor vessel overall length/height [m]	: 12
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4/DUPLEX
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 46000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.8
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.61
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.5
Fuel linear heat generation rate [kW/m]	: 18.3

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.51
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 46440

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.65
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.75
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 272.8
HP cylinder Inlet steam flow rate [t/h]	: 5400

### Main generator

Rated active power [MWe]	: 490
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-2
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-306
Reactor vessel overall length/height [m]	: 12
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4/DUPLEX
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 46000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.7
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.61
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.5
Fuel linear heat generation rate [kW/m]	: 18.3

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.51
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 46550

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.65
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.75
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 272.8
HP cylinder Inlet steam flow rate [t/h]	: 5400

### Main generator

Rated active power [MWe]	: 490
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

**CH-1** **BEZNAU-1** **SWITZERLAND**

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CS SA320B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 10.7
Inside shell diameter [m]	: 3.3
Shell thickness [mm]	: 166
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /MOX
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4/DUPLEX
Average fuel enrichment [% of U235]	: 4.68
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 17
Average discharge burnup [MWd/t]	: 42000
Active core diameter [m]	: 2.45
Active core height/length [m]	: 3.05
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 38
Moderator weight [t]	: 103
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.6
Average core power density [kW/dm <sup>3</sup> ]	: 78
Average fuel power density [kW/kgU]	: 28
Fuel linear heat generation rate [kW/m]	: 16.7

#### Reactivity control



Control rod material	: Ag-In-Cd alloy
Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: H <sub>3</sub> BO <sub>3</sub> Injection
Number of control rod assemblies	: 17

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 103
Operating coolant pressure [MPa]	: 15.3
Reactor outlet temperature [°C]	: 313
Reactor inlet temperature [°C]	: 281
Coolant mass flow at the rated power [t/h]	: 22870

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: SA508MCL3
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 565
Design heat transfer surface [m <sup>2</sup> ]	: 3345

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 3
Design pressure difference [MPa]	: 0.4

### Pressurizer

Total volume [m <sup>3</sup> ]	: 20
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 645

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Spray

Total containment volume [m3]	: 35000
Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: 3
HPSI systems pressure [MPa]	: 10.7
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: 203.4
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.3
HP cylinder Inlet steam moisture [%]	: 0.01
HP cylinder inlet steam temperature [°C]	: 268
HP cylinder Inlet steam flow rate [t/h]	: 995

### Main generator

Rated active power [MWe]	: 190
Rated apparent power [MVA]	: 220
Output voltage [kV]	: 15
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium

Number of main condensate pumps	: 2
Number of main condensate pumps required for full power	: 1
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.7

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 2
Number of feedwater pumps required for full power operation	: 1
Feedwater discharge pressure [MPa]	: 6.76
Steam generator feedwater inlet temperature [°C]	: 212

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 4
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water Sprinkler Only
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: Hydro power station
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 12
Total battery capacity [Ah]	: 6850

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 560
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: 2000

**Non-electrical applications**

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 2

Number of intermediate circuits/heat exchangers	: 2
Total capacity of heat connections [MWt]	: 60
Extraction steam pressure [MPa]	: 0.25

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CS SA320B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 10.7
Inside shell diameter [m]	: 3.3
Shell thickness [mm]	: 166
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4/DUPLEX
Average fuel enrichment [% of U235]	: 4.68
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 17
Average discharge burnup [MWd/t]	: 42000
Active core diameter [m]	: 2.45
Active core height/length [m]	: 3.05
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 38
Moderator weight [t]	: 103
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.6
Average core power density [kW/dm <sup>3</sup> ]	: 78
Average fuel power density [kW/kgU]	: 29
Fuel linear heat generation rate [kW/m]	: 16.7

#### Reactivity control

Control rod material	: Ag-In-Cd alloy
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Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: 103
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 313
Reactor inlet temperature [°C]	: 281
Coolant mass flow at the rated power [t/h]	: 22870

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: Saturated Steam
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: SA508MCL3
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 565
Design heat transfer surface [m2]	: 3345

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 3
Design pressure difference [MPa]	: 0.4

### Pressurizer

Total volume [m3]	: 20
Number of safety valves	: 3
Number of relief valves	: 3
Installed heater power [kW]	: 645

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Spray
Total containment volume [m3]	: 35000

Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: 0.25
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: 3
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: 2
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 10.7
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: 203.4
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 5.3
HP cylinder Inlet steam moisture [%]	: 0.01
HP cylinder inlet steam temperature [°C]	: 268
HP cylinder Inlet steam flow rate [t/h]	: 1145

### Main generator

Rated active power [MWe]	: 190
Rated apparent power [MVA]	: 220
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power	: 1
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.7

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 2
Number of feedwater pumps required for full power operation	: 1
Feedwater discharge pressure [MPa]	: 6.76
Steam generator feedwater inlet temperature [°C]	: 212

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 3
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water Sprinkler Only
Fire retardant cable coating used for	: Safety Related + Other systems
Cable segregation within the unit used for	: Safety Related + Other systems
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: Hydro power station
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 12
Total battery capacity [Ah]	: 6850

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 560
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: 2000

**Non-electrical applications**

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 1
Number of intermediate circuits/heat exchangers	: 1



Total capacity of heat connections [MWt]	: 40
Extraction steam pressure [MPa]	: 0.25

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 22-NiMoCr-37
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: X-10-CR-NI-TI-18.9
Reactor vessel overall length/height [m]	: 11
Inside shell diameter [m]	: 4.79
Shell thickness [mm]	: 215
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 52000
Active core diameter [m]	: 3.24
Active core height/length [m]	: 3.58
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 75.2
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 205
Fuel clad thickness [mm]	: 0.726
Average core power density [kW/dm <sup>3</sup> ]	: 100.5
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 22.6

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 36

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.3
Reactor outlet temperature [°C]	: 324.5
Reactor inlet temperature [°C]	: 291.5
Coolant mass flow at the rated power [t/h]	: 52986

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: -
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 42
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 4
Number of LPSI systems	: 6
Number of hydroaccumulators	: 6
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.65
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: 1650

### Main generator

Rated active power [MWe]	: 1020
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: 3
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : 236

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B/SA-508-CL-2
Vessel cladding material	: <Not Available>
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 21.742
Inside shell diameter [m]	: 6.045
Shell thickness [mm]	: 149
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 18
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 4.38
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 648
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 118.3
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 96
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 62.7
Average fuel power density [kW/kgU]	: 26.4
Fuel linear heat generation rate [kW/m]	: 13.3

#### Reactivity control

Control rod material	: Boron Carbide
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 211

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.31
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 275
Coolant mass flow at the rated power [t/h]	: 40144

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -



Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.76
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 284.8
HP cylinder Inlet steam flow rate [t/h]	: 6120

### Main generator

Rated active power [MWe]	: 1285
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -

Number of main condensate pumps	: -
Number of main condensate pumps required for full power	: -
Condenser vacuum at the full power (absolute pressure) [kPa]	: -

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	: -
Feedwater discharge pressure [MPa]	: -
Steam generator feedwater inlet temperature [°C]	: -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: -
Number of on site non-safety related gas turbines	: -
Other on-site emergency AC power sources	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CST
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 19
Inside shell diameter [m]	: 4.03
Shell thickness [mm]	: 100
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 16.7
Average discharge burnup [MWd/t]	: 48000
Active core diameter [m]	: 2.64
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 240
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 51.7
Average fuel power density [kW/kgU]	: 22.4
Fuel linear heat generation rate [kW/m]	: 14.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 57

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.23
Reactor outlet temperature [°C]	: 288
Reactor inlet temperature [°C]	: 190
Coolant mass flow at the rated power [t/h]	: 15000

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: 2
Number of relief valves	: 4
Installed heater power [kW]	:

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: 4600

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 5.8
Design leakage rate [% per day]	: 1
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 2
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 4
HPSI systems pressure [MPa]	: 7.14
LPSI system pressure [MPa]	: 1.2
HPSI system flowrate [t/h]	: 50
LPSI system flowrate [t/h]	: 400

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 4

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
Number of independent system divisions	: 4

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 6.75
HP cylinder Inlet steam moisture [%]	: 0.01
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 1845

### Main generator

Rated active power [MWe]	: 195
Rated apparent power [MVA]	: 250
Output voltage [kV]	: 15.5
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power : 1

Condenser vacuum at the full power (absolute pressure) [kPa] : 5

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation :

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



TW-1

CHINSHAN-1

TAIWAN, CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-302-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 21.1
Inside shell diameter [m]	: 5.156
Shell thickness [mm]	: 133
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 16
Part of the core refuelled [%]	:
Average discharge burnup [MWd/t]	: 30000
Active core diameter [m]	: 3.47
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 408
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 71.903
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 160
Fuel clad thickness [mm]	: 0.889
Average core power density [kW/dm <sup>3</sup> ]	: 50.5
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 18.41

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 97

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.19
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 215.5
Coolant mass flow at the rated power [t/h]	: 24040

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Spray

Total containment volume [m3]	:
Number of containment spray pumps	:
Containment design pressure [MPa]	: 3.94
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.78
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 636
Rated apparent power [MVA]	: 706.7
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium

Number of main condensate pumps	:
Number of main condensate pumps required for full power	:
Condenser vacuum at the full power (absolute pressure) [kPa]	:

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 3
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 3
Number of feedwater pumps required for full power operation	:
Feedwater discharge pressure [MPa]	:
Steam generator feedwater inlet temperature [°C]	:

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 3
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	:
Cable segregation within the unit used for	:
On-site fire brigade	:
Off-site fire brigade response time	:

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 2
Number of on-site safety related diesel generators (available per unit)	: 2
Number of on-site safety related gas turbines (available per unit)	: 2
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	:
Total installed capacity of the on-site emergency power sources per unit [MW]	:
Total battery capacity [Ah]	:

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Applicable>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	:

### Non-electrical applications

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	:
Extraction steam pressure [MPa]	:

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/SA-302-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 21.1
Inside shell diameter [m]	: 5.156
Shell thickness [mm]	: 133
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	:
Average discharge burnup [MWd/t]	: 30000
Active core diameter [m]	: 3.47
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 408
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 71.946
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 160
Fuel clad thickness [mm]	: 0.889
Average core power density [kW/dm <sup>3</sup> ]	: 50.5
Average fuel power density [kW/kgU]	:
Fuel linear heat generation rate [kW/m]	: 18.41

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 97

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.19
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 215.5
Coolant mass flow at the rated power [t/h]	: 24040

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	:

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: Spray
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 3.94
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: Analogue
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.78
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 636
Rated apparent power [MVA]	: 706.7
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 2
Condenser tube material	: Titanium
Number of main condensate pumps	:



Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Applicable>

Number of motor-driven main feedwater pumps : 3

Number of start-up feed-water pumps (if different from the auxiliary FWP) : 3

Number of feedwater pumps required for full power operation :

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 3

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : Water+Supplementary chemical systems

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 2

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : 2

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Applicable>

Interim storage facility type : <Not Applicable>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Applicable>

Number of heat connection points per unit : <Not Applicable>

Number of intermediate circuits/heat exchangers : <Not Applicable>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CST
Vessel cladding material	: <Not Available>
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 21.3
Inside shell diameter [m]	: 5.54
Shell thickness [mm]	: 136
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 29
Average discharge burnup [MWd/t]	: -
Active core diameter [m]	: 4.18
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 624
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 110.15
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 91
Fuel clad thickness [mm]	: 0.606
Average core power density [kW/dm <sup>3</sup> ]	: 52.4
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 145

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.32
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 275
Coolant mass flow at the rated power [t/h]	: 38322

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.06
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.64
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.8
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 985.6
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CST
Vessel cladding material	: <Not Available>
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 21.3
Inside shell diameter [m]	: 5.54
Shell thickness [mm]	: 136
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 29
Average discharge burnup [MWd/t]	: -
Active core diameter [m]	: 4.18
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 624
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 108.4
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 91
Fuel clad thickness [mm]	: 0.606
Average core power density [kW/dm <sup>3</sup> ]	: 52.4
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 145

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.32
Reactor outlet temperature [°C]	: 284
Reactor inlet temperature [°C]	: 275
Coolant mass flow at the rated power [t/h]	: 38322

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.06
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.64
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280.8
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 985.6
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

TW-5

MAANSHAN-1

TAIWAN, CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CST
Vessel cladding material	: <Not Available>
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.98
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 66.64
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 105.5
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 17.75

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: IFBA/ZYBA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 328.7
Reactor inlet temperature [°C]	: 291.7
Coolant mass flow at the rated power [t/h]	: 49600

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: -
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.22
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 3
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.56
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 281
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 951
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

TW-6

MAANSHAN-2

TAIWAN, CHINA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CST
Vessel cladding material	: <Not Available>
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.98
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 66.64
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 105.5
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 17.75

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: IFBA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 291.7
Coolant mass flow at the rated power [t/h]	: 49600

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: -
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.22
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 3
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.56
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 281
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 951
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

GB-18A

DUNGENESS B-1

UNITED KINGDOM

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: PC
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 17.7
Inside shell diameter [m]	: 20
Shell thickness [mm]	: 3800
Number of pressure channels	: 465
Pressure channel material	: Manganese Steel
Pressure channel wall thickness [mm]	:

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: SS
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 4
Part of the core refuelled [%]	: 4
Average discharge burnup [MWd/t]	: <Not Available>
Active core diameter [m]	: 9.4
Active core height/length [m]	: 7.3
Number of fissile fuel assemblies/bundles	: 2856
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 122
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.4
Average core power density [kW/dm <sup>3</sup> ]	: 127
Average fuel power density [kW/kgU]	: 11.3
Fuel linear heat generation rate [kW/m]	: 14.4

#### Reactivity control

Control rod material	: Boron SS
Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	:
Number of control rod assemblies	: 36

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 3.43
Reactor outlet temperature [°C]	: 673
Reactor inlet temperature [°C]	: 276
Coolant mass flow at the rated power [t/h]	: 13500

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	:
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 12.75
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: <Not Available>



Total containment volume [m3]	:
Number of containment spray pumps	:
Containment design pressure [MPa]	:
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 16.3
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 555
HP cylinder Inlet steam flow rate [t/h]	: 1690

### Main generator

Rated active power [MWe]	: 660
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 11
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>

Number of main condensate pumps	:
Number of main condensate pumps required for full power	:
Condenser vacuum at the full power (absolute pressure) [kPa]	:

**Feedwater system**

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	:
Feedwater discharge pressure [MPa]	:
Steam generator feedwater inlet temperature [°C]	:

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

**Fire protection system**

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	:
Cable segregation within the unit used for	:
On-site fire brigade	:
Off-site fire brigade response time	:

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 4
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	:
Total installed capacity of the on-site emergency power sources per unit [MW]	:
Total battery capacity [Ah]	:

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	:
Extraction steam pressure [MPa]	:

GB-18B

DUNGENESS B-2

UNITED KINGDOM

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: PC
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 17.7
Inside shell diameter [m]	: 20
Shell thickness [mm]	: 3800
Number of pressure channels	: 465
Pressure channel material	: Manganese Steel
Pressure channel wall thickness [mm]	:

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: SS
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 4
Part of the core refuelled [%]	: 4
Average discharge burnup [MWd/t]	: <Not Available>
Active core diameter [m]	: 9.4
Active core height/length [m]	: 7.3
Number of fissile fuel assemblies/bundles	: 2856
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 122
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.4
Average core power density [kW/dm <sup>3</sup> ]	: 12.7
Average fuel power density [kW/kgU]	: 11.3
Fuel linear heat generation rate [kW/m]	: 14.4

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	:
Number of control rod assemblies	: 36

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 3.43
Reactor outlet temperature [°C]	: 673
Reactor inlet temperature [°C]	: 276
Coolant mass flow at the rated power [t/h]	: 13500

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	:
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 12.75
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	:
Design leakage rate [% per day]	:
Type of H <sub>2</sub> recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 16.3
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 555
HP cylinder Inlet steam flow rate [t/h]	: 1690

### Main generator

Rated active power [MWe]	: 670
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 11
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation :

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : 1

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 4

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : <Not Applicable>

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: Concrete with steel prestressing tendons
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 18.3
Inside shell diameter [m]	: 13
Shell thickness [mm]	: 6400
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: 20/25 niobium stabilised
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 4
Part of the core refuelled [%]	: 7.5
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 9.37
Active core height/length [m]	: 8.3
Number of fissile fuel assemblies/bundles	: 2592
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 110
Moderator weight [t]	: 1625
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.37
Average core power density [kW/dm <sup>3</sup> ]	: 2.69
Average fuel power density [kW/kgU]	: 13.6
Fuel linear heat generation rate [kW/m]	: 16.8

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	:
Number of control rod assemblies	: 44

### Reactor coolant system

Number of external reactor coolant loops	: 8
Coolant type	: CO2
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 4.14
Reactor outlet temperature [°C]	: 650
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 13300

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: Superheated Steam
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: MILD/CHROME/S/ST
SG shell material	: Stainless steel / carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 194
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.6
Design pressure difference [MPa]	: 0.28

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: <Not Applicable>

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 1

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 15.96
HP cylinder Inlet steam moisture [%]	: 0
HP cylinder inlet steam temperature [°C]	: 517
HP cylinder Inlet steam flow rate [t/h]	: 1750

### Main generator

Rated active power [MWe]	: 660
Rated apparent power [MVA]	: 776
Output voltage [kV]	: 23
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 2.4

**Feedwater system**

Number of turbine driven main feedwater pumps	: 1
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 1
Feedwater discharge pressure [MPa]	: 21.6
Steam generator feedwater inlet temperature [°C]	: 150

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: 3
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	:

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Applicable>
Number of on-site safety related diesel generators (available per unit)	: <Not Applicable>
Number of on-site safety related gas turbines (available per unit)	: 4
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	: Battery/motor-alternator sets
Estimated time reserve of the batteries at full load [h]	: 0.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 35
Total battery capacity [Ah]	: 1900

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 630
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 3
Number of intermediate circuits/heat exchangers	: 3

Total capacity of heat connections [MWt]	:
Extraction steam pressure [MPa]	: 3.6

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: Concrete with steel prestressing tendons
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 18.3
Inside shell diameter [m]	: 13
Shell thickness [mm]	: 6400
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: 20/25 niobium stabilised
Average fuel enrichment [% of U235]	: <Not Available>
Refuelling frequency [month]	: 4
Part of the core refuelled [%]	: 7.5
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 9.37
Active core height/length [m]	: 8.3
Number of fissile fuel assemblies/bundles	: 2592
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 110
Moderator weight [t]	: 1625
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.37
Average core power density [kW/dm <sup>3</sup> ]	: 2.69
Average fuel power density [kW/kgU]	: 13.6
Fuel linear heat generation rate [kW/m]	: 16.8

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	:
Number of control rod assemblies	: 44

### Reactor coolant system

Number of external reactor coolant loops	: 8
Coolant type	: CO2
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 4.14
Reactor outlet temperature [°C]	: 650
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 13300

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: Superheated Steam
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: MILD/CHROME/S/ST
SG shell material	: Stainless steel / carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 194
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.6
Design pressure difference [MPa]	: 0.28

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: <Not Applicable>

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 1

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 15.96
HP cylinder Inlet steam moisture [%]	: 0
HP cylinder inlet steam temperature [°C]	: 517
HP cylinder Inlet steam flow rate [t/h]	: 1750

### Main generator

Rated active power [MWe]	: 660
Rated apparent power [MVA]	: 776
Output voltage [kV]	: 23
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 2



Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 2.4

### Feedwater system

Number of turbine driven main feedwater pumps	: 1
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 1
Feedwater discharge pressure [MPa]	: 21.6
Steam generator feedwater inlet temperature [°C]	: 150

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: 3
Number of turbine driven pumps	: <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	:

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: 4
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	: Battery / motor-alternator sets
Estimated time reserve of the batteries at full load [h]	: 0.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 35
Total battery capacity [Ah]	: 1900

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 630
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 3
Number of intermediate circuits/heat exchangers	: 3

Total capacity of heat connections [MWt]	:
Extraction steam pressure [MPa]	: 3.6

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: Concrete with steel prestressing tendons
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 18.3
Inside shell diameter [m]	: 13.1
Shell thickness [mm]	: 6400
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: 20/25 niobium stabilised
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 4
Part of the core refuelled [%]	: 7.5
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 9.37
Active core height/length [m]	: 8.3
Number of fissile fuel assemblies/bundles	: 2592
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 110
Moderator weight [t]	: 1625
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.37
Average core power density [kW/dm <sup>3</sup> ]	: 2.69
Average fuel power density [kW/kgU]	: 13.6
Fuel linear heat generation rate [kW/m]	: 16.8

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	:
Number of control rod assemblies	: 44

### Reactor coolant system

Number of external reactor coolant loops	: 8
Coolant type	: CO2
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 4.14
Reactor outlet temperature [°C]	: 650
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 13300

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: Superheated Steam
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: MILD/CHROME/S/ST
SG shell material	: Stainless steel / carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 194
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.6
Design pressure difference [MPa]	: 0.28

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: <Not Applicable>

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 1

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 15.96
HP cylinder Inlet steam moisture [%]	: 0
HP cylinder inlet steam temperature [°C]	: 517
HP cylinder Inlet steam flow rate [t/h]	: 1750

### Main generator

Rated active power [MWe]	: 666
Rated apparent power [MVA]	: 776
Output voltage [kV]	: 23
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 2.4

### Feedwater system

Number of turbine driven main feedwater pumps	: 1
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 1
Feedwater discharge pressure [MPa]	: 21.6
Steam generator feedwater inlet temperature [°C]	: 150

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: 3
Number of turbine driven pumps	: <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	:

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: 4
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	: Battery/motor-alternator sets
Estimated time reserve of the batteries at full load [h]	: 0.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 35
Total battery capacity [Ah]	: 1900

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 756
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 3
Number of intermediate circuits/heat exchangers	: 3

Total capacity of heat connections [MWt]	:
Extraction steam pressure [MPa]	: 3.6

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: Concrete with steel prestressing tendons
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 18.3
Inside shell diameter [m]	: 13.1
Shell thickness [mm]	: 6400
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	:

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: 20/25 niobium stabilised
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 4
Part of the core refuelled [%]	: 7.5
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 9.37
Active core height/length [m]	: 8.3
Number of fissile fuel assemblies/bundles	: 2592
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 110
Moderator weight [t]	: 1625
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.37
Average core power density [kW/dm <sup>3</sup> ]	: 2.69
Average fuel power density [kW/kgU]	: 13.7
Fuel linear heat generation rate [kW/m]	: 15.6

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: <Not Applicable>
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 44

### Reactor coolant system

Number of external reactor coolant loops	: 8
Coolant type	: CO2
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 4.14
Reactor outlet temperature [°C]	: 650
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 13300

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: Superheated Steam
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: MILD/CHROME/S/ST
SG shell material	: Stainless steel / carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 194
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 5.6
Design pressure difference [MPa]	: 0.28

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: <Not Applicable>

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 1

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 15.96
HP cylinder Inlet steam moisture [%]	: 0
HP cylinder inlet steam temperature [°C]	: 577
HP cylinder Inlet steam flow rate [t/h]	: 1750

### Main generator

Rated active power [MWe]	: 660
Rated apparent power [MVA]	: 776
Output voltage [kV]	: 23
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power	: 2
Condenser vacuum at the full power (absolute pressure) [kPa]	: 2.4

### Feedwater system

Number of turbine driven main feedwater pumps	: 1
Number of motor-driven main feedwater pumps	: 1
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 1
Feedwater discharge pressure [MPa]	: 21.6
Steam generator feedwater inlet temperature [°C]	: 150

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: 3
Number of turbine driven pumps	: <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	:

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: 4
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	: Battery/motor alternator sets
Estimated time reserve of the batteries at full load [h]	: 0.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 35
Total battery capacity [Ah]	: 1900

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 756
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

### Non-electrical applications

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 3
Number of intermediate circuits/heat exchangers	: 3

Total capacity of heat connections [MWt]	:
Extraction steam pressure [MPa]	: 3.6

GB-22A

HEYSHAM B-1

UNITED KINGDOM

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: <Not Available>
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 21.9
Inside shell diameter [m]	: 20.3
Shell thickness [mm]	: 5762
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: <Not Available>
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 2
Part of the core refuelled [%]	: 3
Average discharge burnup [MWd/t]	: 27000
Active core diameter [m]	: 9.46
Active core height/length [m]	: 8.31
Number of fissile fuel assemblies/bundles	: 332
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 113
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 8
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 13.6
Fuel linear heat generation rate [kW/m]	: 16.8

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	:
Number of control rod assemblies	: 89

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: CO2
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 4.3
Reactor outlet temperature [°C]	: 635
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 14700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: Austenitic stainless steel and Cr/Mo and mild steel
SG shell material	: Austenitic stainless steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 394
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 5.2
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: 4
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: <Not Applicable>

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 15.9
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1730

### Main generator

Rated active power [MWe]	: 672
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 23.5
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power : 1

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 1

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : <Not Available>

Feedwater discharge pressure [MPa] : 20.0

Steam generator feedwater inlet temperature [°C] : 156

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: <Not Available>
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 21.9
Inside shell diameter [m]	: 20.3
Shell thickness [mm]	: 5762
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	:

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	:
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 2
Part of the core refuelled [%]	: 3
Average discharge burnup [MWd/t]	: 27000
Active core diameter [m]	: 9.46
Active core height/length [m]	: 8.31
Number of fissile fuel assemblies/bundles	: 332
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 113
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 8
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 13.6
Fuel linear heat generation rate [kW/m]	: 16.8

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	:
Number of control rod assemblies	: 89

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: CO2
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 4.3
Reactor outlet temperature [°C]	: 635
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 14700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: Austenitic stainless steel and Cr/Mo and mild steel
SG shell material	: Austenitic stainless steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 394
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 5.2
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: 4
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: <Not Applicable>

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 15.9
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1730

### Main generator

Rated active power [MWe]	: 672
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 23.5
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power : 1

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 1

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : 1

Feedwater discharge pressure [MPa] : 20.0

Steam generator feedwater inlet temperature [°C] : 156

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : 8

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: Ordinary Portland Cement/Pulverised Fuel Ash/Local Aggregate
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 32.75
Inside shell diameter [m]	: 18.9
Shell thickness [mm]	: 5000
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: 20/25 niobium stabilised
Average fuel enrichment [% of U235]	: <Not Available>
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 38500
Active core diameter [m]	: 9.1
Active core height/length [m]	: 8.312
Number of fissile fuel assemblies/bundles	: 2464
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 115
Moderator weight [t]	: 1248
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.368
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 13.2
Fuel linear heat generation rate [kW/m]	: 18.2

#### Reactivity control

Control rod material	: Boron SS
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	:
Number of control rod assemblies	: 81

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	: 120
Operating coolant pressure [MPa]	: 4.24
Reactor outlet temperature [°C]	: 645.5
Reactor inlet temperature [°C]	: 321
Coolant mass flow at the rated power [t/h]	: 13522

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: Superheated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: MILD/CHROME/S/ST
SG shell material	: 321 stainless steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 380
Design heat transfer surface [m2]	: 7727.75

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 0.262

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>



Total containment volume [m3]	: <Not Applicable>
Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 15.85
HP cylinder Inlet steam moisture [%]	: 0
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1721

### Main generator

Rated active power [MWe]	: 660
Rated apparent power [MVA]	: 776.471
Output voltage [kV]	: 23
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium

Number of main condensate pumps	: 2
Number of main condensate pumps required for full power	: 1
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.4

**Feedwater system**

Number of turbine driven main feedwater pumps	: 1
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 8
Number of feedwater pumps required for full power operation	: 1
Feedwater discharge pressure [MPa]	: 21.5
Steam generator feedwater inlet temperature [°C]	: 163

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 4
Number of on-site safety related diesel generators (available per unit)	: 5
Number of on-site safety related gas turbines (available per unit)	: 4
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: battery/rectifier
Estimated time reserve of the batteries at full load [h]	: 0.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 100
Total battery capacity [Ah]	: 10200

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1275
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 3

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: 3.9

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: Ordinary Portland Cement/Pulverised Fuel Ash/Local Aggregate
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 32.75
Inside shell diameter [m]	: 18.9
Shell thickness [mm]	: 5000
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: 20/25 niobium stabilised
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 38500
Active core diameter [m]	: 9.1
Active core height/length [m]	: 8.312
Number of fissile fuel assemblies/bundles	: 2464
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 115
Moderator weight [t]	: 1248
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.368
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 13.2
Fuel linear heat generation rate [kW/m]	: 18.2

#### Reactivity control

Control rod material	: Boron SS
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 81

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	: 120
Operating coolant pressure [MPa]	: 4.24
Reactor outlet temperature [°C]	: 645.5
Reactor inlet temperature [°C]	: 321
Coolant mass flow at the rated power [t/h]	: 13522

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: Superheated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: BS3059/3 mild steel/9%CrMo steel/TP316 stainless steel
SG shell material	: 321 stainless steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 380
Design heat transfer surface [m2]	: 7727.75

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 0.262

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: <Not Applicable>
Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 16
HP cylinder Inlet steam moisture [%]	: 0
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1721

### Main generator

Rated active power [MWe]	: 660
Rated apparent power [MVA]	: 776.471
Output voltage [kV]	: 23
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium

Number of main condensate pumps	: 2
Number of main condensate pumps required for full power	: 1
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.4

**Feedwater system**

Number of turbine driven main feedwater pumps	: 1
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 8
Number of feedwater pumps required for full power operation	: 1
Feedwater discharge pressure [MPa]	: 21.5
Steam generator feedwater inlet temperature [°C]	: 163

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 4
Number of on-site safety related diesel generators (available per unit)	: 5
Number of on-site safety related gas turbines (available per unit)	: 4
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: battery/rectifier
Estimated time reserve of the batteries at full load [h]	: 0.5
Total installed capacity of the on-site emergency power sources per unit [MW]	: 100
Total battery capacity [Ah]	: 10200

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: Turbine Extraction
Number of heat connection points per unit	: 3

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	:
Extraction steam pressure [MPa]	: 3.9



## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: Ordinary Portland Cement/Pulverised Fuel Ash/Local Aggregate
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 32.75
Inside shell diameter [m]	: 18.9
Shell thickness [mm]	: 5000
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: 20/25 niobium stabilised
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: <Not Available>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 38500
Active core diameter [m]	: 9.11
Active core height/length [m]	: 8.312
Number of fissile fuel assemblies/bundles	: 2464
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 115
Moderator weight [t]	: 1248
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.368
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 13.2
Fuel linear heat generation rate [kW/m]	: 18.2

#### Reactivity control

Control rod material	: Boron SS
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd203
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	:
Number of control rod assemblies	: 81

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	: 120
Operating coolant pressure [MPa]	: 4.24
Reactor outlet temperature [°C]	: 648.5
Reactor inlet temperature [°C]	: 318
Coolant mass flow at the rated power [t/h]	: 13522

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: Superheated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: BS3059/3 mild steel/9%CrMo steel/TP316 stainless steel
SG shell material	: 321 stainless steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 379
Design heat transfer surface [m2]	: 9335

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 0.294

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: <Not Applicable>
Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 16.28
HP cylinder Inlet steam moisture [%]	: 0
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1721

### Main generator

Rated active power [MWe]	: 660
Rated apparent power [MVA]	: 776
Output voltage [kV]	: 23
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium

Number of main condensate pumps	: 2
Number of main condensate pumps required for full power	: 1
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.4

**Feedwater system**

Number of turbine driven main feedwater pumps	: 1
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 5
Number of feedwater pumps required for full power operation	: 1
Feedwater discharge pressure [MPa]	: 21.5
Steam generator feedwater inlet temperature [°C]	: 156

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 4
Number of on-site safety related diesel generators (available per unit)	: 5
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: battery/rectifier
Estimated time reserve of the batteries at full load [h]	: 0.25
Total installed capacity of the on-site emergency power sources per unit [MW]	: 100
Total battery capacity [Ah]	: 10200

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1290
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: 0.7

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: Ordinary Portland Cement/Pulverised Fuel Ash/Local Aggregate
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 32.75
Inside shell diameter [m]	: 18.9
Shell thickness [mm]	: 5000
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Rods
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: 20/25 niobium stabilised
Average fuel enrichment [% of U235]	: <Not Available>
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 38500
Active core diameter [m]	: 9.11
Active core height/length [m]	: 8.312
Number of fissile fuel assemblies/bundles	: 2464
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 115
Moderator weight [t]	: 1248
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.368
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 13.2
Fuel linear heat generation rate [kW/m]	: 18.2

#### Reactivity control

Control rod material	: Boron SS
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd203
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: <Not Available>
Number of control rod assemblies	: 81

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	: 120
Operating coolant pressure [MPa]	: 4.24
Reactor outlet temperature [°C]	: 648.5
Reactor inlet temperature [°C]	: 318
Coolant mass flow at the rated power [t/h]	: 13522

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: Superheated Steam
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: mild steel/9%CrMo steel/stainless steel
SG shell material	: 321 stainless steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 379
Design heat transfer surface [m2]	: 9335

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 4.5
Design pressure difference [MPa]	: 0.294

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: <Not Applicable>
Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: Digital
Number of independent system divisions	: 2

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Analogue
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 16.28
HP cylinder Inlet steam moisture [%]	: 0
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1721

### Main generator

Rated active power [MWe]	: 660
Rated apparent power [MVA]	: 776
Output voltage [kV]	: 23
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium



Number of main condensate pumps	: 2
Number of main condensate pumps required for full power	: 1
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.4

**Feedwater system**

Number of turbine driven main feedwater pumps	: 1
Number of motor-driven main feedwater pumps	: 2
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: 5
Number of feedwater pumps required for full power operation	: 1
Feedwater discharge pressure [MPa]	: 21.5
Steam generator feedwater inlet temperature [°C]	: 156

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

**Fire protection system**

On-site fire suppression/extinguishing system	: Water+Supplementary chemical systems
Fire retardant cable coating used for	: Safety Related cables
Cable segregation within the unit used for	: Safety Related cables
On-site fire brigade	: Extra-duty Plant Personnel
Off-site fire brigade response time	: Less than 30 min.

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: 1
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 4
Number of on-site safety related diesel generators (available per unit)	: 5
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: battery/rectifier
Estimated time reserve of the batteries at full load [h]	: 0.25
Total installed capacity of the on-site emergency power sources per unit [MW]	: 100
Total battery capacity [Ah]	: 10200

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1290
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
Number of heat connection points per unit	: <Not Applicable>

Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: <Not Applicable>
Extraction steam pressure [MPa]	: 0.7

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508 Class 3
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 308L/309L
Reactor vessel overall length/height [m]	: 13.59
Inside shell diameter [m]	: 4.39
Shell thickness [mm]	: 220
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4 / M5
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 43
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 101
Moderator weight [t]	: 335
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 33.8
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: 335
Operating coolant pressure [MPa]	: 15.01
Reactor outlet temperature [°C]	: 323.4
Reactor inlet temperature [°C]	: 292.4
Coolant mass flow at the rated power [t/h]	: 69120

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690 alloy
SG shell material	: low alloy steelSA508 Class 3
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 856.3
Design heat transfer surface [m2]	: 5109.5

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: 6
Design pressure difference [MPa]	: 0.89

### Pressurizer

Total volume [m3]	: 51
Number of safety valves	: 8
Number of relief valves	: <Not Applicable>
Installed heater power [kW]	: 1800

### Containment systems

Containment type	: Double
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: 85500

Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 0.35
Design leakage rate [% per day]	: 0.1
Type of H2 recombiner	: Active

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 1
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 12.2
LPSI system pressure [MPa]	: 1.7
HPSI system flowrate [t/h]	: 338
LPSI system flowrate [t/h]	: 696

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Saturated steam
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: <Not Available>
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 6.71
HP cylinder Inlet steam moisture [%]	: 0.25
HP cylinder inlet steam temperature [°C]	: 282.6
HP cylinder Inlet steam flow rate [t/h]	: 6868

### Main generator

Rated active power [MWe]	: 628.8
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 23.5
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 4

Number of main condensate pumps required for full power	: 3
Condenser vacuum at the full power (absolute pressure) [kPa]	: 4.3

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: 6
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	: 4
Feedwater discharge pressure [MPa]	: 9.14
Steam generator feedwater inlet temperature [°C]	: 227

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 2
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: 2

### Fire protection system

On-site fire suppression/extinguishing system	: Water Sprinkler Only
Fire retardant cable coating used for	:
Cable segregation within the unit used for	:
On-site fire brigade	:
Off-site fire brigade response time	:

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Applicable>
Number of on-site safety related diesel generators (available per unit)	: 6
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: 2 station transformers
Estimated time reserve of the batteries at full load [h]	: <Not Available>
Total installed capacity of the on-site emergency power sources per unit [MW]	: <Not Available>
Total battery capacity [Ah]	: <Not Available>

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 1593

### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>
Number of intermediate circuits/heat exchangers	: <Not Available>

Total capacity of heat connections [MWt] :

Extraction steam pressure [MPa] :

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: <Not Available>
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 21.9
Inside shell diameter [m]	: 20.3
Shell thickness [mm]	: 5762
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	:
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 2
Part of the core refuelled [%]	: 3
Average discharge burnup [MWd/t]	: 27000
Active core diameter [m]	: 9.46
Active core height/length [m]	: 8.31
Number of fissile fuel assemblies/bundles	: 332
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 113
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 8
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 13.6
Fuel linear heat generation rate [kW/m]	: 16.8

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	:
Number of control rod assemblies	: 89

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: CO2
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 4.3
Reactor outlet temperature [°C]	: 635
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 14700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: Austenitic stainless steel and Cr/Mo and mild steel
SG shell material	: Austenitic stainless steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 394
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 5.2
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: 4
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: <Not Applicable>

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 15.9
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1730

### Main generator

Rated active power [MWe]	: 672
Rated apparent power [MVA]	: <Not Applicable>
Output voltage [kV]	: 23.5
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power : 1

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 1

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : 1

Feedwater discharge pressure [MPa] : 20.0

Steam generator feedwater inlet temperature [°C] : 156

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) :

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

GB-23B

TORNESS-2

UNITED KINGDOM

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	:
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	:
Reactor vessel overall length/height [m]	: 21.9
Inside shell diameter [m]	: 20.3
Shell thickness [mm]	: 5762
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Stainless Steel
Fuel clad material specification	: <Not Available>
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 2
Part of the core refuelled [%]	: 3
Average discharge burnup [MWd/t]	: 27000
Active core diameter [m]	: 9.46
Active core height/length [m]	: 8.31
Number of fissile fuel assemblies/bundles	: 332
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 113
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 8
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 13.6
Fuel linear heat generation rate [kW/m]	: 16.8

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	:
Number of control rod assemblies	: 89

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: CO2
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 4.3
Reactor outlet temperature [°C]	: 635
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 14700

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: Austenitic stainless steel and Cr/Mo and mild steel
SG shell material	: Austenitic stainless steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: 394
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
Number of pumps per RCS loop	: <Not Applicable>
Pump motor rating [MW]	: 5.2
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Applicable>
Number of safety valves	: <Not Applicable>
Number of relief valves	: 4
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: <Not Applicable>
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>
Total containment volume [m3]	: <Not Applicable>

Number of containment spray pumps	: <Not Applicable>
Containment design pressure [MPa]	: <Not Applicable>
Design leakage rate [% per day]	: <Not Applicable>
Type of H2 recombiner	: <Not Applicable>

### Emergency core cooling systems

Number of HPSI systems	: <Not Applicable>
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: <Not Applicable>
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: <Not Applicable>

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: Superheated steam
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: 1
Number of IP cylinders per turbine	: 1
Number of LP cylinders per turbine	: 3
HP cylinder inlet steam pressure [MPa]	: 15.9
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1730

### Main generator

Rated active power [MWe]	: 672
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 23.5
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: 3
Condenser tube material	: Titanium
Number of main condensate pumps	: 2

Number of main condensate pumps required for full power : 1

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 1

Number of motor-driven main feedwater pumps : 2

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : 1

Feedwater discharge pressure [MPa] : 20.0

Steam generator feedwater inlet temperature [°C] : 156

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 4

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

GB-13A

WYLFA-1

UNITED KINGDOM

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: <Not Available>
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Concrete
Reactor vessel material specification	: PC
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: -
Inside shell diameter [m]	: 29.3
Shell thickness [mm]	: 3360
Number of pressure channels	: -
Pressure channel material	: Manganese Steel
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: <Not Available>
Fuel Form	: <Not Available>
Fuel material	: U
Refuelling type	: ON-line
Moderator material	: GRAPHITE
Fuel clad material	: Magnesium Alloy
Fuel clad material specification	: MAGNOX
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 54000
Active core diameter [m]	: 17.4
Active core height/length [m]	: 9.1
Number of fissile fuel assemblies/bundles	: 49248
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 592.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 1
Fuel clad thickness [mm]	: 3.4
Average core power density [kW/dm <sup>3</sup> ]	: 0.9
Average fuel power density [kW/kgU]	: 2.78
Fuel linear heat generation rate [kW/m]	: 28.6

#### Reactivity control

Control rod material	: Boron SS
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Available>
Secondary shutdown system	: -
Number of control rod assemblies	: 153

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: CO2
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 2.76
Reactor outlet temperature [°C]	: 370
Reactor inlet temperature [°C]	: 230
Coolant mass flow at the rated power [t/h]	: 40000

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: -
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 4
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 2.76
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 3.54
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 320
HP cylinder Inlet steam flow rate [t/h]	: 1180

### Main generator

Rated active power [MWe]	: 335
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

UA-40

KHMELNITSKI-1

UKRAINE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -



Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6290

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>

Number of main condensate pumps	:
Number of main condensate pumps required for full power	:
Condenser vacuum at the full power (absolute pressure) [kPa]	:

**Feedwater system**

Number of turbine driven main feedwater pumps	: 3
Number of motor-driven main feedwater pumps	: <Not Applicable>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 2
Feedwater discharge pressure [MPa]	: 7.6
Steam generator feedwater inlet temperature [°C]	: 220

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: 5
Number of diesel driven pumps	: <Not Applicable>
Number of turbine driven pumps	: <Not Applicable>

**Fire protection system**

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	:
Cable segregation within the unit used for	:
On-site fire brigade	:
Off-site fire brigade response time	:

**Emergency power supply systems**

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Applicable>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: 1
Number of on-site safety related diesel generators (available per unit)	: 3
Number of on-site safety related gas turbines (available per unit)	: <Not Applicable>
Number of on site non-safety related diesel generator	: 2
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 18.9
Total battery capacity [Ah]	: 1500

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

UA-41

KHMELNITSKI-2

UKRAINE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 312
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



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ROVNO-1

UKRAINE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 28600
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 83
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 295.8
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	: 1375

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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ROVNO-2

UKRAINE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 3.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 28600
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 349
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 126
Fuel clad thickness [mm]	: 0.65
Average core power density [kW/dm <sup>3</sup> ]	: 83
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 13.1

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 6
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 12.5
Reactor outlet temperature [°C]	: 295.8
Reactor inlet temperature [°C]	: 267
Coolant mass flow at the rated power [t/h]	: 39000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 6
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 22K carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 6
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: Water Condenser
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 4.4
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 255
HP cylinder Inlet steam flow rate [t/h]	: 1375

### Main generator

Rated active power [MWe]	: 220
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.4
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 278.5
HP cylinder Inlet steam flow rate [t/h]	: 5870

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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ROVNO-4

UKRAINE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.4
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 278.5
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 49

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 3000
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

UA-54

ZAPOROZHYE-1

UKRAINE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



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ZAPOROZHYE-2

UKRAINE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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ZAPOROZHYE-3

UKRAINE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:



Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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ZAPOROZHYE-4

UKRAINE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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ZAPOROZHYE-5

UKRAINE

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	: 6430

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: 15Ch2MFA; 2,5%Cr0.6°Mo0,25%V
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: 08%Cr18%Ni10%Ti
Reactor vessel overall length/height [m]	: 12.95
Inside shell diameter [m]	: 4.136
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR/1%NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.16
Active core height/length [m]	: 3.53
Number of fissile fuel assemblies/bundles	: 163
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 76
Moderator weight [t]	: 330
Number of fuel elements per assembly/bundle	: 317
Fuel clad thickness [mm]	: 0.68
Average core power density [kW/dm <sup>3</sup> ]	: 108
Average fuel power density [kW/kgU]	: 46
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: CRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 61

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 16
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 64000

### Steam generators (SG)/drum separators

Type of SG	: Horizontal
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: 08CH18N10T SS
SG shell material	: 10GN3MFA alloyed carbon steel
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: Spray
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1500
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 274.3
HP cylinder Inlet steam flow rate [t/h]	:

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : 3

Number of motor-driven main feedwater pumps : <Not Applicable>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Applicable>

Number of feedwater pumps required for full power operation : 2

Feedwater discharge pressure [MPa] : 7.6

Steam generator feedwater inlet temperature [°C] : 220

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : 5

Number of diesel driven pumps : <Not Applicable>

Number of turbine driven pumps : <Not Applicable>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Applicable>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : 1

Number of on-site safety related diesel generators (available per unit) : 3

Number of on-site safety related gas turbines (available per unit) : <Not Applicable>

Number of on site non-safety related diesel generator : 2

Number of on site non-safety related gas turbines : <Not Applicable>

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] : 1

Total installed capacity of the on-site emergency power sources per unit [MW] : 18.9

Total battery capacity [Ah] : 1500

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-313

ANO-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.4
Inside shell diameter [m]	: 4.77
Shell thickness [mm]	: 214
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 35000
Active core diameter [m]	: 3.27
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 208
Fuel clad thickness [mm]	: 0.673
Average core power density [kW/dm <sup>3</sup> ]	: 76
Average fuel power density [kW/kgU]	: 31.32
Fuel linear heat generation rate [kW/m]	: 18

#### Reactivity control

Control rod material	: Cadmium Alloy
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 60

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.3
Reactor outlet temperature [°C]	: 318
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 66000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.415
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.3
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 297
HP cylinder Inlet steam flow rate [t/h]	: 5562.4

### Main generator

Rated active power [MWe]	: 903
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>

Number of main condensate pumps	:
Number of main condensate pumps required for full power	:
Condenser vacuum at the full power (absolute pressure) [kPa]	:

### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Available>
Number of motor-driven main feedwater pumps	: <Not Available>
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Available>
Number of feedwater pumps required for full power operation	:
Feedwater discharge pressure [MPa]	:
Steam generator feedwater inlet temperature [°C]	:

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Available>
Number of turbine driven pumps	: <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system	: <Not Available>
Fire retardant cable coating used for	:
Cable segregation within the unit used for	:
On-site fire brigade	:
Off-site fire brigade response time	:

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit)	: <Not Available>
Number of alternate power sources from the transmission grid (standby transformers available per unit)	: <Not Available>
Number of on-site safety related diesel generators (available per unit)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	:
Number of on site non-safety related gas turbines	:
Other on-site emergency AC power sources	:
Estimated time reserve of the batteries at full load [h]	:
Total installed capacity of the on-site emergency power sources per unit [MW]	:
Total battery capacity [Ah]	:

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

### Non-electrical applications

Primary heat connection	: <Not Available>
Number of heat connection points per unit	: <Not Available>

Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-368

ANO-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13.1
Inside shell diameter [m]	: 4.39
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 35000
Active core diameter [m]	: 3.12
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 73.6
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.625
Average core power density [kW/dm <sup>3</sup> ]	: 96.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 323
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 73680

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.08
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 276.1
HP cylinder Inlet steam flow rate [t/h]	: 5550

### Main generator

Rated active power [MWe]	: 943
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-334

BEAVER VALLEY-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: -
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 203
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 43727
Active core diameter [m]	: 3.05
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.817
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 100
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.06

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: ZRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 20000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 266
HP cylinder Inlet steam flow rate [t/h]	: 4895

### Main generator

Rated active power [MWe]	: 888
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-412

BEAVER VALLEY-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: -
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 203
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 36351
Active core diameter [m]	: 3.05
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.406
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.573
Average core power density [kW/dm <sup>3</sup> ]	: 100
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.06

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: ZRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 48

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 20000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 266
HP cylinder Inlet steam flow rate [t/h]	: 5265

### Main generator

Rated active power [MWe]	: 888
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-456

BRAIDWOOD-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA 304
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.36
Inside shell diameter [m]	: 4.39
Shell thickness [mm]	: 216
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 43
Average discharge burnup [MWd/t]	: 49000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 101
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.057
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18.3

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 15470

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.63
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 7550

### Main generator

Rated active power [MWe]	: 1175
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Pond (closed-cycle)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-457

BRAIDWOOD-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA 304
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.36
Inside shell diameter [m]	: 4.39
Shell thickness [mm]	: 216
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 43
Average discharge burnup [MWd/t]	: 49000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 101
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.057
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 20.8

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 15470

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.63
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 7550

### Main generator

Rated active power [MWe]	: 1175
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Pond (closed-cycle)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-259

BROWNS FERRY-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CS!SA302B!SA336
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS SA371 ER309-ER308
Reactor vessel overall length/height [m]	: 22.1
Inside shell diameter [m]	: 6.37
Shell thickness [mm]	: 158.7
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 28
Average discharge burnup [MWd/t]	: 38000
Active core diameter [m]	: 4.8
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 154
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 154
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 48.7
Average fuel power density [kW/kgU]	: 22.8
Fuel linear heat generation rate [kW/m]	: 18.25

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.2
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 275
Coolant mass flow at the rated power [t/h]	: 51250

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 6063

### Main generator

Rated active power [MWe]	: 1152
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-260

BROWNS FERRY-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CS SA302B_SA336
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS SA371 ER309-ER308
Reactor vessel overall length/height [m]	: 22.1
Inside shell diameter [m]	: 6.37
Shell thickness [mm]	: 158.7
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 28
Average discharge burnup [MWd/t]	: 38000
Active core diameter [m]	: 4.8
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 149.9
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 48.7
Average fuel power density [kW/kgU]	: 22.8
Fuel linear heat generation rate [kW/m]	: 18.49

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.2
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 275
Coolant mass flow at the rated power [t/h]	: 51250

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 6063

### Main generator

Rated active power [MWe]	: 1152
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-296

BROWNS FERRY-3

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B/SA-336
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS SA371 ER309-ER308
Reactor vessel overall length/height [m]	: 22.1
Inside shell diameter [m]	: 6.37
Shell thickness [mm]	: 158.7
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 32
Average discharge burnup [MWd/t]	: 38000
Active core diameter [m]	: 4.8
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 149
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 149
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 48.7
Average fuel power density [kW/kgU]	: 23
Fuel linear heat generation rate [kW/m]	: 17.5

#### Reactivity control

Control rod material	: Boron Carbide SS
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.2
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 275
Coolant mass flow at the rated power [t/h]	: 51250

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 6063

### Main generator

Rated active power [MWe]	: 1152
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-325

BRUNSWICK-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.1
Inside shell diameter [m]	: 5.5
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 27800
Active core diameter [m]	: 4.1
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 102.7
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 50.5
Average fuel power density [kW/kgU]	: 23.3
Fuel linear heat generation rate [kW/m]	: 18.42

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 137

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 215
Coolant mass flow at the rated power [t/h]	: 7756

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:



Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.44
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 4745

### Main generator

Rated active power [MWe]	: 849.2
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-324

BRUNSWICK-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.1
Inside shell diameter [m]	: 5.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 27800
Active core diameter [m]	: 4.1
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 102.7
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 1.81
Average core power density [kW/dm <sup>3</sup> ]	: 50.5
Average fuel power density [kW/kgU]	: 23.2
Fuel linear heat generation rate [kW/m]	: 18.61

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 137

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 215
Coolant mass flow at the rated power [t/h]	: 7756

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.44
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 4745

### Main generator

Rated active power [MWe]	: 849.2
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-454

BYRON-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: -
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.36
Inside shell diameter [m]	: 4.19
Shell thickness [mm]	: 216
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 43
Average discharge burnup [MWd/t]	: 49000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 101
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.057
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18.3

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Other - WABA
Burnable neutron absorber material specification	: WABA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 15470

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.63
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 7550

### Main generator

Rated active power [MWe]	: 1175
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-455

BYRON-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: -
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.36
Inside shell diameter [m]	: 4.19
Shell thickness [mm]	: 216
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 43
Average discharge burnup [MWd/t]	: 49000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 101
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.057
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18.3

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 15470

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.63
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 7550

### Main generator

Rated active power [MWe]	: 1175
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-483

CALLAWAY-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS300
Reactor vessel overall length/height [m]	: 13.3
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 216
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 42000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 109.2
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 19.13

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: IFBA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 329
Reactor inlet temperature [°C]	: 293
Coolant mass flow at the rated power [t/h]	: 69012

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed+Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.34
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 6513

### Main generator

Rated active power [MWe]	: 1236
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS308-309
Reactor vessel overall length/height [m]	: 12.8
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.45
Active core height/length [m]	: 3.47
Number of fissile fuel assemblies/bundles	: 217
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 176
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 82.8
Average fuel power density [kW/kgU]	: 30.92
Fuel linear heat generation rate [kW/m]	: 20.62

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: B-4C/GD
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 314
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 63000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600S
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.352
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 274
HP cylinder Inlet steam flow rate [t/h]	: 5058

### Main generator

Rated active power [MWe]	: 900
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS308/!309
Reactor vessel overall length/height [m]	: 12.8
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.45
Active core height/length [m]	: 3.47
Number of fissile fuel assemblies/bundles	: 217
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 176
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 82.8
Average fuel power density [kW/kgU]	: 30.92
Fuel linear heat generation rate [kW/m]	: 20.56

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B-4C/EV
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 37

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 314
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 63000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600S
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.352
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 274
HP cylinder Inlet steam flow rate [t/h]	: 5058

### Main generator

Rated active power [MWe]	: 880
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.7
Inside shell diameter [m]	: 4.6
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 39
Average discharge burnup [MWd/t]	: 40200
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18.3

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 293
Coolant mass flow at the rated power [t/h]	: 16406

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.204
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.83
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 6488.7

### Main generator

Rated active power [MWe]	: 1202
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-414

CATAWBA-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.7
Inside shell diameter [m]	: 4.6
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 46
Average discharge burnup [MWd/t]	: 40200
Active core diameter [m]	: 3.4
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 44.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18.3

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 293
Coolant mass flow at the rated power [t/h]	: 20560

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.204
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.83
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 6488.7

### Main generator

Rated active power [MWe]	: 1205
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-461

CLINTON-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: -
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.3
Inside shell diameter [m]	: 5.54
Shell thickness [mm]	: 137
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 45
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.3
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 624
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 105.4
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.813
Average core power density [kW/dm <sup>3</sup> ]	: 52.4
Average fuel power density [kW/kgU]	: 25.77
Fuel linear heat generation rate [kW/m]	: 18.85

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 145

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.3
Reactor outlet temperature [°C]	: 288.3
Reactor inlet temperature [°C]	: 278.3
Coolant mass flow at the rated power [t/h]	: 38300

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.10
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.66
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 5143

### Main generator

Rated active power [MWe]	: 985
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Pond (closed-cycle)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-397

COLUMBIA

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 22.7
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 162
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 20
Average discharge burnup [MWd/t]	: 42000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 128
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 72
Fuel clad thickness [mm]	: 0.69
Average core power density [kW/dm <sup>3</sup> ]	: 49.2
Average fuel power density [kW/kgU]	: 23.85
Fuel linear heat generation rate [kW/m]	: 43

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.17
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 278
Coolant mass flow at the rated power [t/h]	: 8100

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.316
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.82
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282.7
HP cylinder Inlet steam flow rate [t/h]	: 6133

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-445

COMANCHE PEAK-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.36
Inside shell diameter [m]	: 4.39
Shell thickness [mm]	: 219.2
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 84.497
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.81

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B-4C/Al <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 67771

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m <sup>2</sup> ]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m <sup>3</sup> ]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.103
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.75
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 6866

### Main generator

Rated active power [MWe]	: 1175
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-446

COMANCHE PEAK-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.36
Inside shell diameter [m]	: 4.38
Shell thickness [mm]	: 219.2
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 36000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 81.85
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.5
Fuel linear heat generation rate [kW/m]	: 17.81

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: WABA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 67771

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.103
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.75
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 6866

### Main generator

Rated active power [MWe]	: 1206
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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COOK-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASTM-A-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-308/309/312
Reactor vessel overall length/height [m]	: 13.4
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 38000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 88.6
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 98.8
Average fuel power density [kW/kgU]	: 37
Fuel linear heat generation rate [kW/m]	: 21.98

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 14.76
Reactor outlet temperature [°C]	: 306
Reactor inlet temperature [°C]	: 273
Coolant mass flow at the rated power [t/h]	: 59502

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.19
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.12
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 264.1
HP cylinder Inlet steam flow rate [t/h]	: 5914.7

### Main generator

Rated active power [MWe]	: 1089
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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COOK-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASTM-A-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-308L/309L
Reactor vessel overall length/height [m]	: 13.4
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 216
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 48000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 81
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103.8
Average fuel power density [kW/kgU]	: 36.5
Fuel linear heat generation rate [kW/m]	: 17.81

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
Reactor outlet temperature [°C]	: 319
Reactor inlet temperature [°C]	: 283
Coolant mass flow at the rated power [t/h]	: 60292

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.19
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.43
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267.9
HP cylinder Inlet steam flow rate [t/h]	: 6074.7

### Main generator

Rated active power [MWe]	: 1162
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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COOPER

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	:
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.1
Inside shell diameter [m]	: 5.61
Shell thickness [mm]	: 142.9
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 17349
Active core diameter [m]	: 4.03
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 548
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 101.2
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 51.8
Average fuel power density [kW/kgU]	: 22.7
Fuel linear heat generation rate [kW/m]	: 43.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 137

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.28
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 186
Coolant mass flow at the rated power [t/h]	: 7755

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.83
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 4329

### Main generator

Rated active power [MWe]	: 801
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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DAVIS BESSE-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-18-8
Reactor vessel overall length/height [m]	: 11.9
Inside shell diameter [m]	: 4.3
Shell thickness [mm]	: 214
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 50000
Active core diameter [m]	: 2.9
Active core height/length [m]	: 3.57
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 208
Fuel clad thickness [mm]	: 0.7
Average core power density [kW/dm <sup>3</sup> ]	: 92
Average fuel power density [kW/kgU]	: 33.8
Fuel linear heat generation rate [kW/m]	: 21.1

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B-4C/Al <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 293
Coolant mass flow at the rated power [t/h]	: 68000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m <sup>2</sup> ]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m <sup>3</sup> ]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.22
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 307
HP cylinder Inlet steam flow rate [t/h]	: 4904

### Main generator

Rated active power [MWe]	: 925
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-275

DIABLO CANYON-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13.35
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 102.3
Average fuel power density [kW/kgU]	: 37.54
Fuel linear heat generation rate [kW/m]	: 17.5

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: ZRB-2 IN IFBA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.83
Reactor outlet temperature [°C]	: 320
Reactor inlet temperature [°C]	: 285
Coolant mass flow at the rated power [t/h]	: 60270

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.331
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.38
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267.3
HP cylinder Inlet steam flow rate [t/h]	: 6925

### Main generator

Rated active power [MWe]	: 1136
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-323

DIABLO CANYON-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13.35
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.36
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: ZRB-2 IN IFBA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.83
Reactor outlet temperature [°C]	: 321
Reactor inlet temperature [°C]	: 285
Coolant mass flow at the rated power [t/h]	: 60270

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.331
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.38
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267.3
HP cylinder Inlet steam flow rate [t/h]	: 7083

### Main generator

Rated active power [MWe]	: 1164
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-237

DRESDEN-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304-L
Reactor vessel overall length/height [m]	: 21
Inside shell diameter [m]	: 6.3
Shell thickness [mm]	: 155.6
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 35
Average discharge burnup [MWd/t]	: 47000
Active core diameter [m]	: 4.55
Active core height/length [m]	: 3.6
Number of fissile fuel assemblies/bundles	: 724
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 150
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 81
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 41.1
Average fuel power density [kW/kgU]	: 18.5
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 276
Coolant mass flow at the rated power [t/h]	: 7400

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.43
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.57
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 281.3
HP cylinder Inlet steam flow rate [t/h]	: 4877

### Main generator

Rated active power [MWe]	: 810
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-249

DRESDEN-3

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304-L
Reactor vessel overall length/height [m]	: 21
Inside shell diameter [m]	: 6.3
Shell thickness [mm]	: 155.6
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 35
Average discharge burnup [MWd/t]	: 47000
Active core diameter [m]	: 4.55
Active core height/length [m]	: 3.6
Number of fissile fuel assemblies/bundles	: 724
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 151
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 81
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 42.1
Average fuel power density [kW/kgU]	: 18.5
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 89

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 276
Coolant mass flow at the rated power [t/h]	: 7400

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.43
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.57
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 281.3
HP cylinder Inlet steam flow rate [t/h]	: 4877

### Main generator

Rated active power [MWe]	: 820
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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DUANE ARNOLD-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	:
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 20.2
Inside shell diameter [m]	: 4.65
Shell thickness [mm]	: 117
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 27800
Active core diameter [m]	: 3.33
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 368
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 67.4
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 50.9
Average fuel power density [kW/kgU]	: 23.1
Fuel linear heat generation rate [kW/m]	: 14.4

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 89

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.17
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 278
Coolant mass flow at the rated power [t/h]	: 22273

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.436
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 3096

### Main generator

Rated active power [MWe]	: 565
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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FARLEY-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASTM A 533B1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 203
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.02
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.8
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 101.1
Average fuel power density [kW/kgU]	: 32.3
Fuel linear heat generation rate [kW/m]	: 17.1

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORON
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 45

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 285
Coolant mass flow at the rated power [t/h]	: 45600

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.27
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267
HP cylinder Inlet steam flow rate [t/h]	: 5058

### Main generator

Rated active power [MWe]	: 860
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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FARLEY-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASTM A 533B1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 203
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.02
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.8
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 101.1
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.1

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BORON
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 45

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 285
Coolant mass flow at the rated power [t/h]	: 45600

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.27
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267
HP cylinder Inlet steam flow rate [t/h]	: 1760

### Main generator

Rated active power [MWe]	: 860
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-341

FERMI-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 22.2
Inside shell diameter [m]	: 6.36
Shell thickness [mm]	: 163.2
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 19404
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.8
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 140.3
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.813
Average core power density [kW/dm <sup>3</sup> ]	: 48.7
Average fuel power density [kW/kgU]	: 24
Fuel linear heat generation rate [kW/m]	: 37.73

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BP/BORON INJ
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.3
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 278
Coolant mass flow at the rated power [t/h]	: 6390

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.44
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 6435

### Main generator

Rated active power [MWe]	: 1154
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-333

FITZPATRICK

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B/SA-508-C
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.63
Inside shell diameter [m]	: 5.54
Shell thickness [mm]	: 136.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 31800
Active core diameter [m]	: 3.26
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 100.82
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.813
Average core power density [kW/dm <sup>3</sup> ]	: 50.1
Average fuel power density [kW/kgU]	: 23
Fuel linear heat generation rate [kW/m]	: 19

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 137

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.06
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 278
Coolant mass flow at the rated power [t/h]	: 35000

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.44
Design leakage rate [% per day]	:
Type of H <sub>2</sub> recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 4760

### Main generator

Rated active power [MWe]	: 850
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-285

FORT CALHOUN-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: AS-304
Reactor vessel overall length/height [m]	: 9.8
Inside shell diameter [m]	: 3.94
Shell thickness [mm]	: 181
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 13500
Active core diameter [m]	: 2.7
Active core height/length [m]	: 3.25
Number of fissile fuel assemblies/bundles	: 133
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 47.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 176
Fuel clad thickness [mm]	: 0.75
Average core power density [kW/dm <sup>3</sup> ]	: 80.4
Average fuel power density [kW/kgU]	: 29
Fuel linear heat generation rate [kW/m]	: 49.93

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 14.8
Reactor outlet temperature [°C]	: 312
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 8136

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL - 600MA
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.422
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.85
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 272
HP cylinder Inlet steam flow rate [t/h]	: 2824

### Main generator

Rated active power [MWe]	: 509
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS304
Reactor vessel overall length/height [m]	: 11.2
Inside shell diameter [m]	: 3.352
Shell thickness [mm]	: 165
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 74
Average discharge burnup [MWd/t]	: 39000
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.59
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42.61
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.6
Average core power density [kW/dm <sup>3</sup> ]	: 88.9
Average fuel power density [kW/kgU]	: 31.2
Fuel linear heat generation rate [kW/m]	: 19.02

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: ZRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 17

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
Reactor outlet temperature [°C]	: 317
Reactor inlet temperature [°C]	: 284
Coolant mass flow at the rated power [t/h]	: 29940

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.423
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.1
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 264
HP cylinder Inlet steam flow rate [t/h]	: 2849

### Main generator

Rated active power [MWe]	: 498
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-416

GRAND GULF-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: CST-SS-CLAD
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 22.3
Inside shell diameter [m]	: 6.38
Shell thickness [mm]	: 156
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 28000
Active core diameter [m]	: 4.8
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 800
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 144.5
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 54.1
Average fuel power density [kW/kgU]	: 26.2
Fuel linear heat generation rate [kW/m]	: 19.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	:
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 193

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.31
Reactor outlet temperature [°C]	: 288
Reactor inlet temperature [°C]	: 278
Coolant mass flow at the rated power [t/h]	: 7483

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.105
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.925
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 7484.3

### Main generator

Rated active power [MWe]	: 1372.5
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-400

HARRIS-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533/304-CLAD
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 204
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 31500
Active core diameter [m]	: 3.03
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 73.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.559
Average core power density [kW/dm <sup>3</sup> ]	: 105
Average fuel power density [kW/kgU]	: 39.6
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B2O3
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 52

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 16480

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.32
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.56
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 5100

### Main generator

Rated active power [MWe]	: 950
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-321

HATCH-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	:
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.1
Inside shell diameter [m]	: 5.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: <Not Available>
Fuel clad material specification	:
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 17000
Active core diameter [m]	: 4.27
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 114
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 49.15
Average fuel power density [kW/kgU]	: 23.3
Fuel linear heat generation rate [kW/m]	: 18.4

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 137

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 279
Reactor inlet temperature [°C]	: 196
Coolant mass flow at the rated power [t/h]	: 4450

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.435
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 4565.4

### Main generator

Rated active power [MWe]	: 850
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-366

HATCH-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	:
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.1
Inside shell diameter [m]	: 5.54
Shell thickness [mm]	: 140
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: <Not Available>
Fuel clad material specification	:
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 18750
Active core diameter [m]	: 4.27
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 103.4
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 49.15
Average fuel power density [kW/kgU]	: 23.8
Fuel linear heat generation rate [kW/m]	: 18.4

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 137

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 279
Reactor inlet temperature [°C]	: 218
Coolant mass flow at the rated power [t/h]	: 4450

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.435
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 2
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 4565.4

### Main generator

Rated active power [MWe]	: 850
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-354

HOPE CREEK-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 22.3
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 159
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 30000
Active core diameter [m]	: 4.8
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 139.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 48.7
Average fuel power density [kW/kgU]	: 23.6
Fuel linear heat generation rate [kW/m]	: 17.52

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.17
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 278
Coolant mass flow at the rated power [t/h]	: 45350

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.56
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 7424

### Main generator

Rated active power [MWe]	: 1118
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13.2
Inside shell diameter [m]	: 4.3
Shell thickness [mm]	: 218
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 36000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 88.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.617
Average core power density [kW/dm <sup>3</sup> ]	: 85
Average fuel power density [kW/kgU]	: 31.1
Fuel linear heat generation rate [kW/m]	: 18.81

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
Reactor outlet temperature [°C]	: 309
Reactor inlet temperature [°C]	: 276
Coolant mass flow at the rated power [t/h]	: 15450

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.09
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 264
HP cylinder Inlet steam flow rate [t/h]	: 5291

### Main generator

Rated active power [MWe]	: 1022
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-286

INDIAN POINT-3

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13.34
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 16
Average discharge burnup [MWd/t]	: 14000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 92.7
Average fuel power density [kW/kgU]	: 34.14
Fuel linear heat generation rate [kW/m]	: 21

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: WABA/ZRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 17.47
Reactor outlet temperature [°C]	: 315.8
Reactor inlet temperature [°C]	: 283.7
Coolant mass flow at the rated power [t/h]	: 25000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.33
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.028
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 264.4
HP cylinder Inlet steam flow rate [t/h]	: 5555

### Main generator

Rated active power [MWe]	: 1030
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-373

LASALLE-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: -
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 22.2
Inside shell diameter [m]	: 6.38
Shell thickness [mm]	: 171.4
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.88
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 158
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 72
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 48.7
Average fuel power density [kW/kgU]	: 20.8
Fuel linear heat generation rate [kW/m]	: 44

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 274
Coolant mass flow at the rated power [t/h]	: 8097

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.41
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.65
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282.4
HP cylinder Inlet steam flow rate [t/h]	: 6475

### Main generator

Rated active power [MWe]	: 1122
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Pond (closed-cycle)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-374

LASALLE-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: -
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 22.2
Inside shell diameter [m]	: 6.38
Shell thickness [mm]	: 171.4
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.88
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 158
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 72
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 48.7
Average fuel power density [kW/kgU]	: 20.84
Fuel linear heat generation rate [kW/m]	: 44

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 274
Coolant mass flow at the rated power [t/h]	: 8097

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.41
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.65
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282.4
HP cylinder Inlet steam flow rate [t/h]	: 6475

### Main generator

Rated active power [MWe]	: 1122
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Pond (closed-cycle)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-352

LIMERICK-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 22.4
Inside shell diameter [m]	: 6.38
Shell thickness [mm]	: 160
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.57
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.711
Average core power density [kW/dm <sup>3</sup> ]	: 52.57
Average fuel power density [kW/kgU]	: 23.64
Fuel linear heat generation rate [kW/m]	: 16.4

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 282
Reactor inlet temperature [°C]	: 277
Coolant mass flow at the rated power [t/h]	: 7720

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.65
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 291
HP cylinder Inlet steam flow rate [t/h]	: 7410

### Main generator

Rated active power [MWe]	: 1150
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-353

LIMERICK-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 22.4
Inside shell diameter [m]	: 6.38
Shell thickness [mm]	: 160
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.57
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 192
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.711
Average core power density [kW/dm <sup>3</sup> ]	: 52.6
Average fuel power density [kW/kgU]	: 23.64
Fuel linear heat generation rate [kW/m]	: 16.4

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 282
Reactor inlet temperature [°C]	: 277
Coolant mass flow at the rated power [t/h]	: 15500

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.65
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 291
HP cylinder Inlet steam flow rate [t/h]	: 7410

### Main generator

Rated active power [MWe]	: 1150
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-369

MCGUIRE-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.7
Inside shell diameter [m]	: 4.6
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 37
Average discharge burnup [MWd/t]	: 40200
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18.3

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 293
Coolant mass flow at the rated power [t/h]	: 16046

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.204
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.83
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 6488.7

### Main generator

Rated active power [MWe]	: 1220
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-370

MCGUIRE-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.7
Inside shell diameter [m]	: 4.6
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 39
Average discharge burnup [MWd/t]	: 40600
Active core diameter [m]	: 3.4
Active core height/length [m]	: 3.7
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18.3

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 293
Coolant mass flow at the rated power [t/h]	: 16046

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.2
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.83
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 6488.7

### Main generator

Rated active power [MWe]	: 1220
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-336

MILLSTONE-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.8
Inside shell diameter [m]	: 4.37
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.45
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 87.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 176
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 40.8
Average fuel power density [kW/kgU]	: 30.9
Fuel linear heat generation rate [kW/m]	: 18.5

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 49

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 312.7
Reactor inlet temperature [°C]	: 286.67
Coolant mass flow at the rated power [t/h]	: 13832

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600TT
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.483
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.73
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: 5664.8

### Main generator

Rated active power [MWe]	: 880
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-423

MILLSTONE-3

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: MNMO
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13.36
Inside shell diameter [m]	: 3.33
Shell thickness [mm]	: 203
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.4
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 580
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 86.57
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.572
Average core power density [kW/dm <sup>3</sup> ]	: 78.5
Average fuel power density [kW/kgU]	: 33.19
Fuel linear heat generation rate [kW/m]	: 18.2

#### Reactivity control

Control rod material	: Carbon Steel
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 24

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.9
Reactor outlet temperature [°C]	: 327
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 21111

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600TT
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.17
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.7
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: -
HP cylinder Inlet steam flow rate [t/h]	: 3478

### Main generator

Rated active power [MWe]	: 1253
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-263

MONTICELLO

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: CST-GRB-SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: ER308ELC
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 5.21
Shell thickness [mm]	: 131
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 75
Average discharge burnup [MWd/t]	: 27000
Active core diameter [m]	: 3.96
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 484
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 91.1
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 63
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 41.1
Average fuel power density [kW/kgU]	: 17.8
Fuel linear heat generation rate [kW/m]	: 39

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: 7/ASS
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 121

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.17
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 277
Coolant mass flow at the rated power [t/h]	: 6800

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: 44
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 1620

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Reinforced Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.394
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 3074

### Main generator

Rated active power [MWe]	: 568
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-220

NINE MILE POINT-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B/CST
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-308 / SS304
Reactor vessel overall length/height [m]	: 19.5
Inside shell diameter [m]	: 5.4
Shell thickness [mm]	: 181
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 34
Average discharge burnup [MWd/t]	: 26000
Active core diameter [m]	: 4
Active core height/length [m]	: 3.7
Number of fissile fuel assemblies/bundles	: 532
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 93.6
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 63
Fuel clad thickness [mm]	: 0.7
Average core power density [kW/dm <sup>3</sup> ]	: 40.6
Average fuel power density [kW/kgU]	: 17.9
Fuel linear heat generation rate [kW/m]	: 15.5

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 129

### Reactor coolant system

Number of external reactor coolant loops	: 5
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.13
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 277
Coolant mass flow at the rated power [t/h]	: 30612

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 5
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.436
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.79
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 3306

### Main generator

Rated active power [MWe]	: 625
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-410

NINE MILE POINT-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	:
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 22.1
Inside shell diameter [m]	: 6.38
Shell thickness [mm]	: 164
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 26
Average discharge burnup [MWd/t]	: 32300
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 141
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.7
Average core power density [kW/dm <sup>3</sup> ]	: 49.15
Average fuel power density [kW/kgU]	: 22.08
Fuel linear heat generation rate [kW/m]	: 17.68

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.17
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 278
Coolant mass flow at the rated power [t/h]	: 49206

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.316
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 7500

### Main generator

Rated active power [MWe]	: 1214
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-338

NORTH ANNA-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA533B1 SA508 II
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-308INCONEL
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 199
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 39000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 108.7
Average fuel power density [kW/kgU]	: 33.88
Fuel linear heat generation rate [kW/m]	: 18.59

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 32

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 327
Reactor inlet temperature [°C]	: 298
Coolant mass flow at the rated power [t/h]	: 16073

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.316
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.82
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 272
HP cylinder Inlet steam flow rate [t/h]	: 5417.8

### Main generator

Rated active power [MWe]	: 984
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-339

NORTH ANNA-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-308INCONEL
Reactor vessel overall length/height [m]	: 13.17
Inside shell diameter [m]	: 3.99
Shell thickness [mm]	: 199
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 39000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 108.7
Average fuel power density [kW/kgU]	: 38.4
Fuel linear heat generation rate [kW/m]	: 18.59

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 32

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 327
Reactor inlet temperature [°C]	: 298
Coolant mass flow at the rated power [t/h]	: 16073

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.316
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.82
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 272
HP cylinder Inlet steam flow rate [t/h]	: 5418.7

### Main generator

Rated active power [MWe]	: 984
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-269

OCONEE-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-18-8
Reactor vessel overall length/height [m]	: 13.9
Inside shell diameter [m]	: 4.77
Shell thickness [mm]	: 214
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 34
Average discharge burnup [MWd/t]	: 30000
Active core diameter [m]	: 3.27
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 94.1
Moderator weight [t]	: 240
Number of fuel elements per assembly/bundle	: 208
Fuel clad thickness [mm]	: 0.67
Average core power density [kW/dm <sup>3</sup> ]	: 83.4
Average fuel power density [kW/kgU]	: 30.9
Fuel linear heat generation rate [kW/m]	: 19

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 318
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 20000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: INCOLOY-800
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.513
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.33
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 297
HP cylinder Inlet steam flow rate [t/h]	: 5078

### Main generator

Rated active power [MWe]	: 893
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-270

OCONEE-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA534
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-18-8
Reactor vessel overall length/height [m]	: 12.4
Inside shell diameter [m]	: 4.77
Shell thickness [mm]	: 214
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 34
Average discharge burnup [MWd/t]	: 30000
Active core diameter [m]	: 3.27
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 94.1
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 208
Fuel clad thickness [mm]	: 0.67
Average core power density [kW/dm <sup>3</sup> ]	: 83.4
Average fuel power density [kW/kgU]	: 30.9
Fuel linear heat generation rate [kW/m]	: 19.06

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 318
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 20000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: INCONEL-600S
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.513
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.33
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 297
HP cylinder Inlet steam flow rate [t/h]	: 5078

### Main generator

Rated active power [MWe]	: 893
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-287

OCONEE-3

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA534
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-18-8
Reactor vessel overall length/height [m]	: 12.4
Inside shell diameter [m]	: 4.77
Shell thickness [mm]	: 214
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 34
Average discharge burnup [MWd/t]	: 30000
Active core diameter [m]	: 3.27
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 94.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 208
Fuel clad thickness [mm]	: 0.67
Average core power density [kW/dm <sup>3</sup> ]	: 83.4
Average fuel power density [kW/kgU]	: 31.3
Fuel linear heat generation rate [kW/m]	: 19.06

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 28

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 318
Reactor inlet temperature [°C]	: 290
Coolant mass flow at the rated power [t/h]	: 20000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: INCONEL-600S
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.513
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.33
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 297
HP cylinder Inlet steam flow rate [t/h]	: 5078

### Main generator

Rated active power [MWe]	: 893
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-219

OYSTER CREEK

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B/CST
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 19.5
Inside shell diameter [m]	: 5.4
Shell thickness [mm]	: 181
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 4.07
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 125
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.813
Average core power density [kW/dm <sup>3</sup> ]	: 40.6
Average fuel power density [kW/kgU]	: 17
Fuel linear heat generation rate [kW/m]	: 47.6

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 5
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 288
Reactor inlet temperature [°C]	: 271
Coolant mass flow at the rated power [t/h]	: 7723

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 5
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.43
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.65
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 3288

### Main generator

Rated active power [MWe]	: 687.5
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-255

PALISADES

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B/CST
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.5
Inside shell diameter [m]	: 4.37
Shell thickness [mm]	: 216
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 28
Average discharge burnup [MWd/t]	: 33205
Active core diameter [m]	: 3.47
Active core height/length [m]	: 3.34
Number of fissile fuel assemblies/bundles	: 204
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 81.428
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 208
Fuel clad thickness [mm]	: 0.749
Average core power density [kW/dm <sup>3</sup> ]	: 79.8
Average fuel power density [kW/kgU]	: 32.1
Fuel linear heat generation rate [kW/m]	: 25.73

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: GD 203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 14.48
Reactor outlet temperature [°C]	: 305
Reactor inlet temperature [°C]	: 280
Coolant mass flow at the rated power [t/h]	: 64366

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.387
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.18
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 265
HP cylinder Inlet steam flow rate [t/h]	: 4864

### Main generator

Rated active power [MWe]	: 867
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-528

PALO VERDE-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 14.63
Inside shell diameter [m]	: 4.63
Shell thickness [mm]	: 230
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 38000
Active core diameter [m]	: 3.65
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 241
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 99.03
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 95.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18.14

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 76

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 327
Reactor inlet temperature [°C]	: 296
Coolant mass flow at the rated power [t/h]	: 25288

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.45
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 7
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 288
HP cylinder Inlet steam flow rate [t/h]	: 8790

### Main generator

Rated active power [MWe]	: 1303
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-529

PALO VERDE-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 14.63
Inside shell diameter [m]	: 4.63
Shell thickness [mm]	: 230
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 38000
Active core diameter [m]	: 3.65
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 241
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 99.03
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 95.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18.21

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 76

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 327
Reactor inlet temperature [°C]	: 296
Coolant mass flow at the rated power [t/h]	: 25288

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.45
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 7
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 288
HP cylinder Inlet steam flow rate [t/h]	: 8790

### Main generator

Rated active power [MWe]	: 1303
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-530

PALO VERDE-3

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 14.63
Inside shell diameter [m]	: 4.63
Shell thickness [mm]	: 230
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 38000
Active core diameter [m]	: 3.65
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 241
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 99.03
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 95.6
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 18.37

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 76

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 327
Reactor inlet temperature [°C]	: 296
Coolant mass flow at the rated power [t/h]	: 25288

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Single
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.45
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 7
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 288
HP cylinder Inlet steam flow rate [t/h]	: 8790

### Main generator

Rated active power [MWe]	: 1303
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-277

PEACH BOTTOM-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASME-SA-336 / SA533B CC1339
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: SA-371-ER-309_ER-308
Reactor vessel overall length/height [m]	: 22
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 160
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 48000
Active core diameter [m]	: 4.57
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 134.2
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.711
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: 22.8
Fuel linear heat generation rate [kW/m]	: 16.37

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 276
Coolant mass flow at the rated power [t/h]	: 7720

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.16
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.65
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 290.6
HP cylinder Inlet steam flow rate [t/h]	: 6062

### Main generator

Rated active power [MWe]	: 1098
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-278

PEACH BOTTOM-3

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASME-SA-336 / SA533B CC1339
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: SA-371-ER-309_ER-308
Reactor vessel overall length/height [m]	: 22
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 160
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 48000
Active core diameter [m]	: 4.75
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 137.8
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.813
Average core power density [kW/dm <sup>3</sup> ]	: 48.8
Average fuel power density [kW/kgU]	: 22.7
Fuel linear heat generation rate [kW/m]	: 18.24

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 277
Coolant mass flow at the rated power [t/h]	: 7720

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.16
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.65
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 290.6
HP cylinder Inlet steam flow rate [t/h]	: 6062

### Main generator

Rated active power [MWe]	: 1098
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-440

PERRY-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	:
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.74
Inside shell diameter [m]	: 6.045
Shell thickness [mm]	: 150
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 7614
Active core diameter [m]	: 4.65
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 748
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 152.1
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.813
Average core power density [kW/dm <sup>3</sup> ]	: 54
Average fuel power density [kW/kgU]	: 26.25
Fuel linear heat generation rate [kW/m]	: 19.85

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 177

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.31
Reactor outlet temperature [°C]	: 285.5
Reactor inlet temperature [°C]	: 278.3
Coolant mass flow at the rated power [t/h]	: 6985

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.105
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285.5
HP cylinder Inlet steam flow rate [t/h]	: 7000

### Main generator

Rated active power [MWe]	: 1250
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-293

PILGRIM-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	:
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 19.7
Inside shell diameter [m]	: 5.7
Shell thickness [mm]	: 145
Number of pressure channels	: <Not Applicable>
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 25000
Active core diameter [m]	: 4.14
Active core height/length [m]	: 3.69
Number of fissile fuel assemblies/bundles	: 580
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 113
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.812
Average core power density [kW/dm <sup>3</sup> ]	: 40.2
Average fuel power density [kW/kgU]	: 17.86
Fuel linear heat generation rate [kW/m]	:

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	:

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.17
Reactor outlet temperature [°C]	: 296
Reactor inlet temperature [°C]	: 276
Coolant mass flow at the rated power [t/h]	: 7650

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.397
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 3621

### Main generator

Rated active power [MWe]	: 687
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-266

POINT BEACH-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 11.4
Inside shell diameter [m]	: 5.84
Shell thickness [mm]	: 165.1
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 74
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 2.46
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 50
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 87
Average fuel power density [kW/kgU]	: 32.1
Fuel linear heat generation rate [kW/m]	: 18.7

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: IFBA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 316
Reactor inlet temperature [°C]	: 285
Coolant mass flow at the rated power [t/h]	: 31900

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.422
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.55
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269
HP cylinder Inlet steam flow rate [t/h]	: 2777

### Main generator

Rated active power [MWe]	: 524
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-301

POINT BEACH-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 11.4
Inside shell diameter [m]	: 5.84
Shell thickness [mm]	: 165.1
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 74
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 2.44
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 51
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 88
Average fuel power density [kW/kgU]	: 32.1
Fuel linear heat generation rate [kW/m]	: 18.7

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: IFBA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 316
Reactor inlet temperature [°C]	: 285
Coolant mass flow at the rated power [t/h]	: 31800

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.422
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.55
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 269
HP cylinder Inlet steam flow rate [t/h]	: 2777

### Main generator

Rated active power [MWe]	: 524
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-282

PRAIRIE ISLAND-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304 INCONEL
Reactor vessel overall length/height [m]	: 11.9
Inside shell diameter [m]	: 3.35
Shell thickness [mm]	: 178
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 51000
Active core diameter [m]	: 2.45
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42.9
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95
Average fuel power density [kW/kgU]	: 33.8
Fuel linear heat generation rate [kW/m]	: 20.3

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 315
Reactor inlet temperature [°C]	: 280
Coolant mass flow at the rated power [t/h]	: 15470

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.291
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.06
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 263
HP cylinder Inlet steam flow rate [t/h]	: 3165

### Main generator

Rated active power [MWe]	: 560
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-306

PRAIRIE ISLAND-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304 INCONEL
Reactor vessel overall length/height [m]	: 11.9
Inside shell diameter [m]	: 3.35
Shell thickness [mm]	: 178
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 51000
Active core diameter [m]	: 2.45
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 121
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 42.9
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 179
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 95
Average fuel power density [kW/kgU]	: 33.8
Fuel linear heat generation rate [kW/m]	: 20.3

#### Reactivity control

Control rod material	: <Not Available>
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 21

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 315
Reactor inlet temperature [°C]	: 280
Coolant mass flow at the rated power [t/h]	: 15470

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: INCONEL 600
SG shell material	:
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	:
Design heat transfer surface [m2]	:

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.291
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.06
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 263
HP cylinder Inlet steam flow rate [t/h]	: 3165

### Main generator

Rated active power [MWe]	: 560
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-254

QUAD CITIES-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304-L
Reactor vessel overall length/height [m]	: 21
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 155.6
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 35
Average discharge burnup [MWd/t]	: 47000
Active core diameter [m]	: 4.55
Active core height/length [m]	: 3.6
Number of fissile fuel assemblies/bundles	: 724
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 150
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 64
Fuel clad thickness [mm]	: 0.84
Average core power density [kW/dm <sup>3</sup> ]	: 40.6
Average fuel power density [kW/kgU]	: 18.4
Fuel linear heat generation rate [kW/m]	: 43.96

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 177

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 276
Coolant mass flow at the rated power [t/h]	: 7400

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.43
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.57
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 281.3
HP cylinder Inlet steam flow rate [t/h]	: 3898

### Main generator

Rated active power [MWe]	: 810
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-265

QUAD CITIES-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304-L
Reactor vessel overall length/height [m]	: 21
Inside shell diameter [m]	: 6.4
Shell thickness [mm]	: 155.6
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 35
Average discharge burnup [MWd/t]	: 47000
Active core diameter [m]	: 4.55
Active core height/length [m]	: 3.6
Number of fissile fuel assemblies/bundles	: 724
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 150
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 64
Fuel clad thickness [mm]	: 0.84
Average core power density [kW/dm <sup>3</sup> ]	: 40.6
Average fuel power density [kW/kgU]	: 18.3
Fuel linear heat generation rate [kW/m]	: 43.96

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: Gd 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 177

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 276
Coolant mass flow at the rated power [t/h]	: 7400

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.43
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.57
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 281.3
HP cylinder Inlet steam flow rate [t/h]	: 3898

### Main generator

Rated active power [MWe]	: 810
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-458

RIVER BEND-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA- 533-B
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: AS-SAF-5.9
Reactor vessel overall length/height [m]	: 21.29
Inside shell diameter [m]	: 5.54
Shell thickness [mm]	: 152
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 29600
Active core diameter [m]	: 4.29
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 624
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 112.6
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 64
Fuel clad thickness [mm]	: 0.813
Average core power density [kW/dm <sup>3</sup> ]	: 52.4
Average fuel power density [kW/kgU]	: 25.9
Fuel linear heat generation rate [kW/m]	: 18.86

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 145

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.56
Reactor outlet temperature [°C]	: 288
Reactor inlet temperature [°C]	: 278
Coolant mass flow at the rated power [t/h]	: 7400

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.105
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282.4
HP cylinder Inlet steam flow rate [t/h]	: 5647

### Main generator

Rated active power [MWe]	: 991
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-261

ROBINSON-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302/304-CLAD
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.89
Inside shell diameter [m]	: 3.95
Shell thickness [mm]	: 237
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: <Not Available>
Fuel clad material specification	: -
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 30000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 70
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.762
Average core power density [kW/dm <sup>3</sup> ]	: 82.6
Average fuel power density [kW/kgU]	: 32
Fuel linear heat generation rate [kW/m]	: 43.96

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: <Not Available>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 45

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.71
Reactor outlet temperature [°C]	: 318
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 15271

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.295
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.4
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267
HP cylinder Inlet steam flow rate [t/h]	: 4349

### Main generator

Rated active power [MWe]	: 775
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-272

SALEM-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASTM A 533/508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.4
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 114.3
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.4
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 102.6
Average fuel power density [kW/kgU]	: 37.7
Fuel linear heat generation rate [kW/m]	: 17.85

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 285
Coolant mass flow at the rated power [t/h]	: 65600

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.38
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267
HP cylinder Inlet steam flow rate [t/h]	: 5400

### Main generator

Rated active power [MWe]	: 1132
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-311

SALEM-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: ASTM A 533/508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.4
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 114.3
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 3.4
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 102.6
Average fuel power density [kW/kgU]	: 38.5
Fuel linear heat generation rate [kW/m]	: 17.85

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 285
Coolant mass flow at the rated power [t/h]	: 66000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.38
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 268
HP cylinder Inlet steam flow rate [t/h]	: 5547

### Main generator

Rated active power [MWe]	: 1158
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-443

SEABROOK-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: -
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13.36
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 216
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 101
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 43.6
Average fuel power density [kW/kgU]	: 38.92
Fuel linear heat generation rate [kW/m]	: 17.18

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B2O3
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 57

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 64445

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Water Condenser
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.37
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 7.14
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 288
HP cylinder Inlet steam flow rate [t/h]	: 7520

### Main generator

Rated active power [MWe]	: 1200
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-327

SEQUOYAH-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13.3
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 215
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 37
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89.27
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103.8
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 17.85

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: WABA/IFBA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
Reactor outlet temperature [°C]	: 322.4
Reactor inlet temperature [°C]	: 285.9
Coolant mass flow at the rated power [t/h]	: 62600

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.84
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.85
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 272.6
HP cylinder Inlet steam flow rate [t/h]	: 6465.7

### Main generator

Rated active power [MWe]	: 1221
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-328

SEQUOYAH-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CST-SS-CLAD
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13.3
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 37
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89.4
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 103.8
Average fuel power density [kW/kgU]	: 38.5
Fuel linear heat generation rate [kW/m]	: 17.85

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: WABA/IFBA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
Reactor outlet temperature [°C]	: 322.4
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 62600

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.84
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.85
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 272.6
HP cylinder Inlet steam flow rate [t/h]	: 7127

### Main generator

Rated active power [MWe]	: 1221
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-498

SOUTH TEXAS-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.4
Inside shell diameter [m]	: 5.57
Shell thickness [mm]	: 213
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 16.7
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.27
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 117.82
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 98
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.03

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 330
Reactor inlet temperature [°C]	: 293
Coolant mass flow at the rated power [t/h]	: 64150

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.397
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 7.55
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 289.6
HP cylinder Inlet steam flow rate [t/h]	: 7012

### Main generator

Rated active power [MWe]	: 1312
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Pond (closed-cycle)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-499

SOUTH TEXAS-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.4
Inside shell diameter [m]	: 5.57
Shell thickness [mm]	: 213
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZIRLO
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 16.7
Average discharge burnup [MWd/t]	: 43000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 4.27
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 117.82
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 98.8
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 17.03

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 330
Reactor inlet temperature [°C]	: 293
Coolant mass flow at the rated power [t/h]	: 64150

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.397
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 7.55
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 289.6
HP cylinder Inlet steam flow rate [t/h]	: 7012

### Main generator

Rated active power [MWe]	: 1312
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Cooling Pond (closed-cycle)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation :

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-335

ST. LUCIE-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA- 533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.8
Inside shell diameter [m]	: 4.8
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.45
Active core height/length [m]	: 3.47
Number of fissile fuel assemblies/bundles	: 217
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 92.7
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 176
Fuel clad thickness [mm]	: 0.66
Average core power density [kW/dm <sup>3</sup> ]	: 83.2
Average fuel power density [kW/kgU]	: 31
Fuel linear heat generation rate [kW/m]	: 19.4

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: GD 203/B-4C/Al203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
Reactor outlet temperature [°C]	: 314
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 55337

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.38
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267
HP cylinder Inlet steam flow rate [t/h]	: 4739

### Main generator

Rated active power [MWe]	: 842
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-389

ST. LUCIE-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-CIB
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.5
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 35
Average discharge burnup [MWd/t]	: 36000
Active core diameter [m]	: 3.45
Active core height/length [m]	: 3.47
Number of fissile fuel assemblies/bundles	: 217
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 92.7
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.635
Average core power density [kW/dm <sup>3</sup> ]	: 83.2
Average fuel power density [kW/kgU]	: 31.3
Fuel linear heat generation rate [kW/m]	: 14.5

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B-4C/Al <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 91

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 314
Reactor inlet temperature [°C]	: 288
Coolant mass flow at the rated power [t/h]	: 63049

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m <sup>2</sup> ]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m <sup>3</sup> ]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.31
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.38
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267
HP cylinder Inlet steam flow rate [t/h]	: 4733

### Main generator

Rated active power [MWe]	: 935
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CS
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.33
Inside shell diameter [m]	: 4
Shell thickness [mm]	: 197
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4,ZIRLO
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 43.3
Average discharge burnup [MWd/t]	: 38900
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 65.42
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 38.3
Fuel linear heat generation rate [kW/m]	: 17.83

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: ZRB-2
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: -

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 327
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 47400

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-690
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.4
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 8.33
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 315.6
HP cylinder Inlet steam flow rate [t/h]	: 5538.5

### Main generator

Rated active power [MWe]	: 933
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-280

SURRY-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-2/CS ASTM-A-533B CLASS 1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304 INCONEL SA-B-16
Reactor vessel overall length/height [m]	: 12.32
Inside shell diameter [m]	: 3.4
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4,ZIRLO
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 38
Average discharge burnup [MWd/t]	: 48000
Active core diameter [m]	: 3.035
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.38
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.617
Average core power density [kW/dm <sup>3</sup> ]	: 92
Average fuel power density [kW/kgU]	: 34.6
Fuel linear heat generation rate [kW/m]	: 21.6

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: A1B4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 32

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 318
Reactor inlet temperature [°C]	: 283
Coolant mass flow at the rated power [t/h]	: 67000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600TT
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.422
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 4506

### Main generator

Rated active power [MWe]	: 850
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-281

SURRY-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-508-CL-2/CS ASTM-A-533B CLASS 1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304 INCONEL SA-B-16
Reactor vessel overall length/height [m]	: 12.3
Inside shell diameter [m]	: 3.4
Shell thickness [mm]	: 200
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4,ZIRLO
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 38
Average discharge burnup [MWd/t]	: 48000
Active core diameter [m]	: 3.035
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 72.41
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.617
Average core power density [kW/dm <sup>3</sup> ]	: 92
Average fuel power density [kW/kgU]	: 34.6
Fuel linear heat generation rate [kW/m]	: 21.6

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: A1B4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 32

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 318
Reactor inlet temperature [°C]	: 283
Coolant mass flow at the rated power [t/h]	: 67000

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600TT
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.422
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.59
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 4506

### Main generator

Rated active power [MWe]	: 850
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-387

SUSQUEHANNA-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 22
Inside shell diameter [m]	: 6.3
Shell thickness [mm]	: 163.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 36000
Active core diameter [m]	: 4.57
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 133.2
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 79
Fuel clad thickness [mm]	: 0.76
Average core power density [kW/dm <sup>3</sup> ]	: 48.7
Average fuel power density [kW/kgU]	: 23.82
Fuel linear heat generation rate [kW/m]	: 19.32

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.19
Reactor outlet temperature [°C]	: 304
Reactor inlet temperature [°C]	: 195
Coolant mass flow at the rated power [t/h]	: 6170

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:



Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.372
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.69
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282.2
HP cylinder Inlet steam flow rate [t/h]	: 7075

### Main generator

Rated active power [MWe]	: 1134
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-388

SUSQUEHANNA-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 22
Inside shell diameter [m]	: 6.3
Shell thickness [mm]	: 163.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 36000
Active core diameter [m]	: 4.57
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 764
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 132.3
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 79
Fuel clad thickness [mm]	: 0.76
Average core power density [kW/dm <sup>3</sup> ]	: 48.7
Average fuel power density [kW/kgU]	: 23.82
Fuel linear heat generation rate [kW/m]	: 14.32

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.19
Reactor outlet temperature [°C]	: 287
Reactor inlet temperature [°C]	: 195
Coolant mass flow at the rated power [t/h]	: 6170

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.372
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.69
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282.2
HP cylinder Inlet steam flow rate [t/h]	: 7075

### Main generator

Rated active power [MWe]	: 1134
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-289

THREE MILE ISLAND-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12.4
Inside shell diameter [m]	: 4.34
Shell thickness [mm]	: 214
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 24
Part of the core refuelled [%]	: 40
Average discharge burnup [MWd/t]	: 54000
Active core diameter [m]	: 3.27
Active core height/length [m]	: 3.6
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 82.1
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 208
Fuel clad thickness [mm]	: 0.67
Average core power density [kW/dm <sup>3</sup> ]	: 84.7
Average fuel power density [kW/kgU]	: 30.44
Fuel linear heat generation rate [kW/m]	: 18.83

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 32

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 14.9
Reactor outlet temperature [°C]	: 318
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 65771

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: INCONEL-600S
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.38
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.28
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 311
HP cylinder Inlet steam flow rate [t/h]	: 4790

### Main generator

Rated active power [MWe]	: 871
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-250

TURKEY POINT-3

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-GR-B; ASTM A-508B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.8
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 200.8
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 79.8
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 82.8
Average fuel power density [kW/kgU]	: 30.9
Fuel linear heat generation rate [kW/m]	: 18

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: WABA/IFBA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 338
Reactor inlet temperature [°C]	: 285.7
Coolant mass flow at the rated power [t/h]	: 46039

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600TT
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: Cylindrical
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.41
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.13
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 266
HP cylinder Inlet steam flow rate [t/h]	: 4068

### Main generator

Rated active power [MWe]	: 728
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -



Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-251

TURKEY POINT-4

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-302-GR-B; ASTM A-508B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.65
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 200.8
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 3.04
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 157
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 79.8
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 204
Fuel clad thickness [mm]	: 0.62
Average core power density [kW/dm <sup>3</sup> ]	: 82.8
Average fuel power density [kW/kgU]	: 30.9
Fuel linear heat generation rate [kW/m]	: 18

#### Reactivity control

Control rod material	: Cadmium Alloy
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Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: WABA
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.7
Reactor outlet temperature [°C]	: 338
Reactor inlet temperature [°C]	: 285.7
Coolant mass flow at the rated power [t/h]	: 46039

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600TT
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 3
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.41
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 5.13
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 266
HP cylinder Inlet steam flow rate [t/h]	: 4068

### Main generator

Rated active power [MWe]	: 728
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-271

VERMONT YANKEE

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: CS SA-533B
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS ER-309
Reactor vessel overall length/height [m]	: 19.2
Inside shell diameter [m]	: 5.2
Shell thickness [mm]	: 133
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	:
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33760
Active core diameter [m]	: 3.3
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 368
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 65.4
Moderator weight [t]	:
Number of fuel elements per assembly/bundle	: 61
Fuel clad thickness [mm]	: 0.812
Average core power density [kW/dm <sup>3</sup> ]	: 50.96
Average fuel power density [kW/kgU]	: 22.4
Fuel linear heat generation rate [kW/m]	: 42.5

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	:
Number of control rod assemblies	:

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	:
Operating coolant pressure [MPa]	: 7.13
Reactor outlet temperature [°C]	: 288
Reactor inlet temperature [°C]	: 189
Coolant mass flow at the rated power [t/h]	: 1116

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Available>
Number of SG	: <Not Applicable>
Number of drum separators	: <Not Applicable>
Tube shape	: <Not Applicable>
Tube material	: <Not Applicable>
SG shell material	: <Not Applicable>
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: <Not Applicable>
Design heat transfer surface [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 2
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	:
Design pressure difference [MPa]	:

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	:

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Available>
Containment structure	: <Not Available>
Pressure suppression system	: <Not Available>
Additional pressure suppression system	: <Not Available>
Total containment volume [m3]	:

Number of containment spray pumps	:
Containment design pressure [MPa]	: 0.39
Design leakage rate [% per day]	:
Type of H2 recombiner	:

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	:
LPSI system pressure [MPa]	:
HPSI system flowrate [t/h]	:
LPSI system flowrate [t/h]	:

### Reactor protection system

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: <Not Available>
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 2913

### Main generator

Rated active power [MWe]	: 540
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-424

VOGTLE-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CS
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.9
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 222
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 36400
Active core diameter [m]	: 3.4
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 111.4
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 33.7
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 64500

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600TT
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.365
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	:
Number of IP cylinders per turbine	:
Number of LP cylinders per turbine	:
HP cylinder inlet steam pressure [MPa]	: 6.81
HP cylinder Inlet steam moisture [%]	:
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 7283.5

### Main generator

Rated active power [MWe]	: 1157
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	:
Output frequency [Hz]	:

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: <Not Available>
Number of main condensate pumps	:

Number of main condensate pumps required for full power :

Condenser vacuum at the full power (absolute pressure) [kPa] :

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation :

Feedwater discharge pressure [MPa] :

Steam generator feedwater inlet temperature [°C] :

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for :

Cable segregation within the unit used for :

On-site fire brigade :

Off-site fire brigade response time :

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : 2

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator :

Number of on site non-safety related gas turbines :

Other on-site emergency AC power sources :

Estimated time reserve of the batteries at full load [h] :

Total installed capacity of the on-site emergency power sources per unit [MW] :

Total battery capacity [Ah] :

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>



Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-425

VOGTLE-2

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Carbon Steel
Reactor vessel material specification	: CS
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.9
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 222
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 36400
Active core diameter [m]	: 3.4
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 111.4
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 104.5
Average fuel power density [kW/kgU]	: 33.7
Fuel linear heat generation rate [kW/m]	: 17.8

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
Reactor outlet temperature [°C]	: 325
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 64500

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL-600TT
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: Single
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.365
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.81
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 7283.5

### Main generator

Rated active power [MWe]	: 1157
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-382

WATERFORD-3

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13.3
Inside shell diameter [m]	: 4.37
Shell thickness [mm]	: 192.5
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33450
Active core diameter [m]	: 3.45
Active core height/length [m]	: 3.81
Number of fissile fuel assemblies/bundles	: 217
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89.5
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 236
Fuel clad thickness [mm]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 94.9
Average fuel power density [kW/kgU]	: 39.6
Fuel linear heat generation rate [kW/m]	: 17.52

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 41

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 322
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 67100

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 2
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 79
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: 2520

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -



Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.309
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.05
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 275
HP cylinder Inlet steam flow rate [t/h]	: 6303

### Main generator

Rated active power [MWe]	: 1153
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River (once-through)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

US-390

WATTS BAR-1

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 13.4
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 215.1
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 32
Average discharge burnup [MWd/t]	: 36000
Active core diameter [m]	: 3.37
Active core height/length [m]	: 3.65
Number of fissile fuel assemblies/bundles	: 193
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 88.6
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 102.1
Average fuel power density [kW/kgU]	: 38.6
Fuel linear heat generation rate [kW/m]	: 17.88

#### Reactivity control

Control rod material	: Boron Carbide
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSIL GLASS
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.71
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 15910

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Steel+Concrete
Pressure suppression system	: Ice Condenser
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.105
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.85
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 6464

### Main generator

Rated active power [MWe]	: 1270
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Towers
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



US-482

WOLF CREEK

UNITED STATES OF AMERICA

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Hemispherical End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Alloyed Steel
Reactor vessel material specification	: SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 12.9
Inside shell diameter [m]	: 4.4
Shell thickness [mm]	: 219
Number of pressure channels	: <Not Applicable>
Pressure channel material	: <Not Applicable>
Pressure channel wall thickness [mm]	: <Not Applicable>

#### Reactor Core

Fuel assembly geometry	: Square
Fuel Form	: <Not Available>
Fuel material	: UO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: ZR-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	: 6.3
Active core height/length [m]	: 5.94
Number of fissile fuel assemblies/bundles	: 22
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 89.4
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
Average core power density [kW/dm <sup>3</sup> ]	: 101.9
Average fuel power density [kW/kgU]	: 38.4
Fuel linear heat generation rate [kW/m]	: 17.85

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al203/B-4C
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: -
Number of control rod assemblies	: 53

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
Reactor outlet temperature [°C]	: 326
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 15900

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 4
Number of drum separators	: <Not Applicable>
Tube shape	: U-tube
Tube material	: INCONEL 600
SG shell material	: -
Drum separator shell material	: <Not Applicable>
Design thermal capacity per SG [MW]	: -
Design heat transfer surface [m2]	: -

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 1
Pump motor rating [MW]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: <Not Available>
Number of safety valves	: <Not Available>
Number of relief valves	: <Not Available>
Installed heater power [kW]	: -

### Containment systems

Containment type	: <Not Available>
Containment Shape	: <Not Available>
Containment structure	: Pre-stressed Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -
Total containment volume [m3]	: -

Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.42
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
HPSI systems pressure [MPa]	: -
LPSI system pressure [MPa]	: -
HPSI system flowrate [t/h]	: -
LPSI system flowrate [t/h]	: -

### Reactor protection system

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: -
Number of independent system divisions	: <Not Available>

## Secondary systems

### Turbine

Turbine type	: <Not Available>
Number of turbine-generators per unit/reactor	: 1
Turbine speed [rpm]	: 1800
Number of HP cylinders per turbine	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.86
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282.2
HP cylinder Inlet steam flow rate [t/h]	: 7191.4

### Main generator

Rated active power [MWe]	: 1233
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Cooling Pond (closed-cycle)
Number of condensers per turbine-generator	: <Not Available>
Condenser tube material	: -
Number of main condensate pumps	: -

Number of main condensate pumps required for full power : -

Condenser vacuum at the full power (absolute pressure) [kPa] : -

### Feedwater system

Number of turbine driven main feedwater pumps : <Not Available>

Number of motor-driven main feedwater pumps : <Not Available>

Number of start-up feed-water pumps (if different from the auxiliary FWP) : <Not Available>

Number of feedwater pumps required for full power operation : -

Feedwater discharge pressure [MPa] : -

Steam generator feedwater inlet temperature [°C] : -

### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps : <Not Available>

Number of diesel driven pumps : <Not Available>

Number of turbine driven pumps : <Not Available>

### Fire protection system

On-site fire suppression/extinguishing system : <Not Available>

Fire retardant cable coating used for : -

Cable segregation within the unit used for : -

On-site fire brigade : -

Off-site fire brigade response time : -

### Emergency power supply systems

Number of alternate power sources from the neighbouring units (available per unit) : <Not Available>

Number of alternate power sources from the transmission grid (standby transformers available per unit) : <Not Available>

Number of on-site safety related diesel generators (available per unit) : <Not Available>

Number of on-site safety related gas turbines (available per unit) : <Not Available>

Number of on site non-safety related diesel generator : -

Number of on site non-safety related gas turbines : -

Other on-site emergency AC power sources : -

Estimated time reserve of the batteries at full load [h] : -

Total installed capacity of the on-site emergency power sources per unit [MW] : -

Total battery capacity [Ah] : -

### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies) : <Not Available>

Interim storage facility type : <Not Available>

Interim storage facility capacity (number of spent fuel assemblies) : -

### Non-electrical applications

Primary heat connection : <Not Available>

Number of heat connection points per unit : <Not Available>

Number of intermediate circuits/heat exchangers : <Not Available>

Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -