

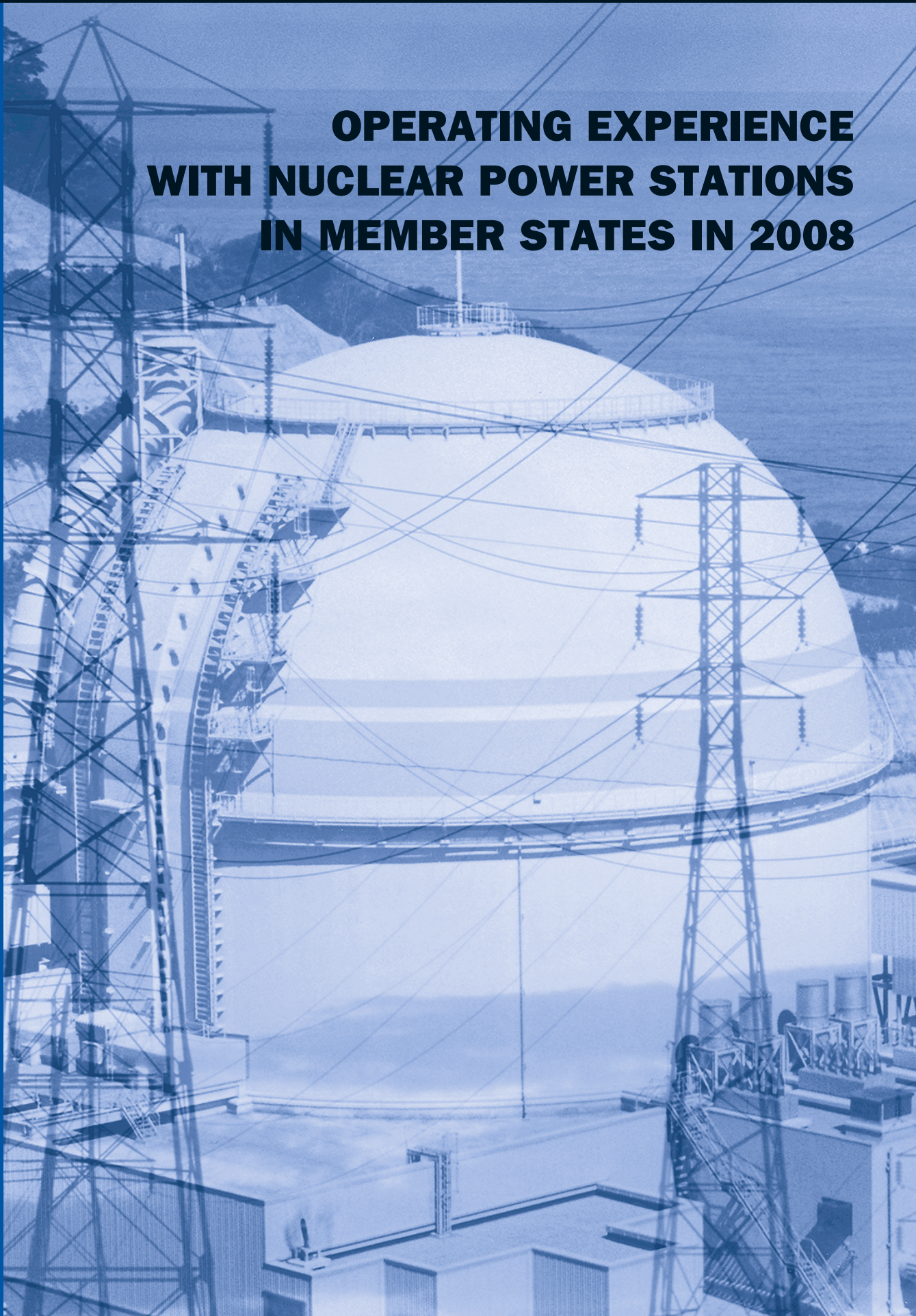


# IAEA

International Atomic Energy Agency

2009 Edition

## **OPERATING EXPERIENCE WITH NUCLEAR POWER STATIONS IN MEMBER STATES IN 2008**





OPERATING EXPERIENCE  
WITH NUCLEAR POWER STATIONS  
IN MEMBER STATES IN 2008

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The Agency's Statute was approved on 23 October 1956 by the Conference on the Statute of the IAEA held at United Nations Headquarters, New York; it entered into force on 29 July 1957. The Headquarters of the Agency are situated in Vienna. Its principal objective is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world".

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# OPERATING EXPERIENCE WITH NUCLEAR POWER STATIONS IN MEMBER STATES IN 2008

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## **FOREWORD**

This report is the fortieth in the Agency'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 six figures illustrating worldwide performance and statistical data. Since 2006 the report is in an electronic version on CD-ROM which provides enhanced features for data searching and analysing.

It is hoped that this report and related Agency publications will be useful to everyone concerned with nuclear power reactors. Suggestions and corrections from readers would be most welcome.

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## 1. INTRODUCTION

This report is the fortieth in the Agency's series of annual reports on operating experience with nuclear power stations in Member States. For the fourth time it is issued purely in an electronic version.

The report is a direct output from the Agency's Power Reactor Information System (PRIS), whose databank contains all operating experience data published in the Agency's operating experience annual reports since 1970 and basic information on power reactors, including design data. It presents operating experience data for all worldwide nuclear power plants after starting commercial operation. The PRIS databank is available free of charge to IAEA Member States through its three services: PRIS-Statistics, PRIS-PC, and PRIS CD-ROM. The PRIS-Statistics and PRIS-PC allow direct access to the database through the Internet. Those front-end-tool interfaces allow searching and querying through pre-designed statistics. PRIS outputs are also available on the PRIS web-site: [www.iaea.org/pris](http://www.iaea.org/pris). It contains publicly available information about reactor units and nuclear industry results.

Load, operation and availability factors are used as the basic performance indicators. Energy unavailability factors, 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 lost through a unit not being available. However, some ambiguity remains in the operators' reports of the unavailability data, resulting in inconsistencies in these factors. It is recognized that there is an inherent difficulty in reporting unavailability in energy due to external causes with relation to energy losses due to load following operation and grid limitation. It should be noted that, for load, operation and unavailability factors, there might be differences between the data of this report and those published elsewhere. To avoid confusion, reference should be made to the definitions given in Section 2. In Section 3 this report presents figures illustrating worldwide performance indicators up to 2008.

According to the information available to the Agency at the end of 2008, there were 438 nuclear power reactors operating in the world, with a total net capacity of 371.6 GW<sub>(e)</sub>.

In 2008 no new reactors were connected to the grid. It was the first year since 1955 without at least one new reactor coming on line. One reactor was permanently shut down : Bohunice 2 (408 MW<sub>(e)</sub>) in Slovakia.

At the end of 2008 there were 44 nuclear power plants under construction in the world with a total net capacity 40 GW<sub>(e)</sub>. In 2008 there were ten construction starts: Ningde 1 and 2, Hongyanhe 2, Fuqing 1, Yangjiang 1 and Fangjiashan 1, in China, Novovoronezh 2-1 and Leningrad 2-1 in Russia, Shin Kori 3 and Shin-Wolsong 2 in the Republic of Korea.



The scope of publication has been enhanced by information related to non-electrical application of nuclear power reactors. Section 6 consists of production data related to district heating, industrial process heat delivery and to water desalination. In 2008 the nuclear energy was utilized for non-electrical application in 11 Member States involving energy from 74 nuclear reactors.

The 2009 edition has been extended by detail design characteristics of reactor units and by dashboards providing a general overview of each individual operating nuclear power plant.

This publication includes information received by the Agency up to 1 June 2009. Up to this date data from all operating units had been reported. Any data modification received after that date, although not included in this publication, is available in the PRIS database.

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

The report was compiled by staff of the Agency's Division of Nuclear Power. It is hoped that it will be useful to nuclear power plant operators, nuclear system designers, nuclear power planners, interested professional engineers and scientists and others concerned with the operating experience of nuclear power reactors. Suggestions and corrections from readers would be most welcome.

## 2. DEFINITIONS

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

The reference unit power is 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; it includes therefore the power taken by the station auxiliaries and losses in transformers that are considered integral parts of 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, for a given period, is the ratio of the energy, which the power unit has produced over that 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>]

The available capacity at a given moment is the maximum net capacity 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 loss is the energy which could have been produced during the reference period by 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 comprise shutdowns, unplanned load reductions or outage extensions.

## 11. Unavailability

The unit unavailability is defined as 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 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 over a specified period, is the ratio of the energy that the available capacity could have produced during this 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 over a specified period is the ratio of the energy losses EL that have not been produced during this 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 to generate 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. Construction start

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

### 16. First criticality

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

### 17. Grid connection

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

### 18. Commercial operation

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

### 19. Permanent Shutdown

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

### 20. Long-term Shutdown

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

### 21. 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 had been shut down for less than 10 hours).

## **22. 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.

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

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

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

## **26. 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.

## **27. Main causes of outages**

- (A) Plant equipment failure
- (B) Refuelling without a 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) Offsite heat distribution system unavailability
- (U) Security and access control and other preventive shutdown due to external threats
- (Z) Others

## **28. 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

### 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
JP	JAPAN
KR	KOREA, REPUBLIC OF
KZ	KAZAKHSTAN
LT	LITHUANIA, 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

ALP	ALABAMA POWER CO.
AMERGEN	AMERGEN ENERGY Co.
AMERGENE	AMERGEN ENERGY GENERATING CO.
ANAV	ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID)
ANPPJSC	Joint Stock Company Armenian NPP
AZPSO	ARIZONA PUBLIC SERVICE CO.
BE	BRITISH ENERGY
BKW	BKW ENERGIE AG
BRUCEPOW	BRUCE POWER
CCNPP	Calvert Cliffs Nuclear Power Plant Inc.
CEA/EDF	Commissariat à l'Energie Atomique (80%) Electricité de France (20%)
CEZ	CZECH POWER COMPANY , CEZ a.s.
CFE	COMISION FEDERAL DE ELECTRICIDAD
CHUBU	CHUBU ELECTRIC POWER CO.,INC.
CHUGOKU	THE CHUGOKU ELECTRIC POWER CO.,INC.
CNAT	CENTRALES NUCLEARES ALMARAZ-TRILLO(ID/UFG/ENDESA/HC/NUCLENOR )

CONSENEC	Consumers Energy Co.
DETED	DETROIT EDISON CO.
DOMENGY	DOMINION ENERGY KEWAUNEE
DOMIN	DOMINION VIRGINIA POWER
DUKE	DUKE POWER CO.
E.ON	E.ON Kernkraft GmbH
EA	JSC "Concern Energoatom"
EDF	ELECTRICITE DE FRANCE
ELECTRAB	ELECTRABEL M. V. NUCLEAIRE PRODUKTIE
ELETRONU	ELETROBRAS TERMONUCLEAR SA - ELETRONUCLEAR
ENERGYNW	Energy Northwest
EnKK	EnBW Kernkraft GmbH (Sitz in Obrigheim)
ENTERGY	ENTERGY NUCLEAR
ENTGARKS	Entergy Arkansas, Inc.
ENTGS	ENTERGY GULF STATES INC.
EPZ	N.V. ELEKTRICITEITS-PRODUKTIEMAATSCHAPPIJ ZUID-NEDERLAND
ESKOM	ESKOM
EXELON	Exelon Generation
FENOC	FIRST ENERGY NUCLEAR OPERATING CO.
FKA	FORSMARK KRAFTGRUPP AB
FORTUMPH	FORTUM POWER AND HEAT OY (former IVO)
FPL	FLORIDA POWER & LIGHT CO.
FPLDUANE	FPL ENERGY DUANE ARNOLD
GNPJVC	GUANDONG NUCLEAR POWER JOINT VENTURE COMPANY LIMITED(GNPJVC)
HEPCO	HOKKAIDO ELECTRIC POWER CO.,INC.
HOKURIKU	HOKURIKU ELECTRIC POWER CO.
HQ	HYDRO QUEBEC
ID	IBERDROLA, S.A.
IMPCO	INDIANA MICHIGAN POWER CO.
INPP	IGNALINA NUCLEAR POWER PLANT
JAPCO	JAPAN ATOMIC POWER CO.
JNPC	Jiangsu Nuclear Power Corporation
KEPCO	KANSAI ELECTRIC POWER CO.
KGECO	Kansas Gas and Electric Co.
KGG	Kernkraftwerk Gundremmingen GmbH
KHNP	Korea Hydro and Nuclear Power Co.
KKB	Kernkraftwerk Brunsbüttel GmbH
KKG	KERNKRAFTWERK GOESGEN-DAENIKEN AG
KKK	Kernkraftwerk Krümmel GmbH & Co. oHG
KKL	KERNKRAFTWERK LEIBSTADT
KLE	Kernkraftwerke Lippe-Ems GmbH
KOZNPP	KOZLODUY NPP-plc
KWG	Gemeinschaftskernkraftwerk Grohnde GmbH & Co. oHG
KYUSHU	KYUSHU ELECTRIC POWER CO.,INC.
LANPC	LINGAO NUCLEAR POWER COMPANY LTD.
MEL	Magnox Electric Limited
NASA	NUCLEOELECTRICA ARGENTINA S.A.
NBEP	NEW BRUNSWICK ELECTRIC POWER COMMISSION
NEK	Nuklearna elektrarna Krško
NMPNSLLC	Nine Mile Point Nuclear Station, LLC
NNEG	NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>
NOK	NORDOSTSCHWEIZERISCHE KRAFTWERKE
NORTHERN	Northern States Power Co.
NPCIL	NUCLEAR POWER CORPORATION OF INDIA LTD.

NPPD	NEBRASKA PUBLIC POWER DISTRICT
NPQJVC	NUCLEAR POWER PLANT QINSHAN JOINT VENTURE COMPANY LTD.
NUCLENOR	NUCLENOR, S.A.
OKG	OKG AKTIEBOLAG
OPG	ONTARIO POWER GENERATION
OPPD	OMAHA PUBLIC POWER DISTRICT
PAEC	PAKISTAN ATOMIC ENERGY COMMISSION
PAKS Zrt	PAKS NUCLEAR POWER PLANT LTD
PGE	PACIFIC GAS & ELECTRIC CO.
PP&L	PENNSYLVANIA POWER & LIGHT CO.
PROGENGC	Progress Energy Carolinas, Inc.
PROGRESS	Progress Energy Corporation
PSEG	PUBLIC SERVICE ELECTRIC & GAS CO.
PSEGPOWER	PSEG Power, Inc.
QNPC	QINSHAN NUCLEAR POWER COMPANY
RAB	Ringhals AB
RWE	RWE Power AG
SCE	SOUTHERN CALIFORNIA EDISON
SCEG	SOUTH CAROLINA ELECTRIC & GAS CO.
SE,plc	Slovenské elektrárne, a.s.
SHIKOKU	SHIKOKU ELECTRIC POWER CO.,INC
SNN	SOCIETATEA NATIONALA NUCLEARELECTRICA S.A.
SOUTH	Southern Nuclear Operating Co.
STP	STP Nuclear Operating Co.
TEPCO	TOKYO ELECTRIC POWER CO.,INC.
TOHOKU	TOHOKU ELECTRIC POWER CO.,INC
TPC	TAI POWER CO.
TQNPC	The Third Qinshan Jointed Venture Company Ltda.
TVA	TENNESSEE VALLEY AUTHORITY
TVO	TEOLLISUUDEN VOIMA OY
TXU	TXU Electric Co.
VEPCO	VIRGINIA ELECTRIC POWER CO.
WEP	WISCONSIN ELECTRIC POWER CO.

#### CONTRACTORS

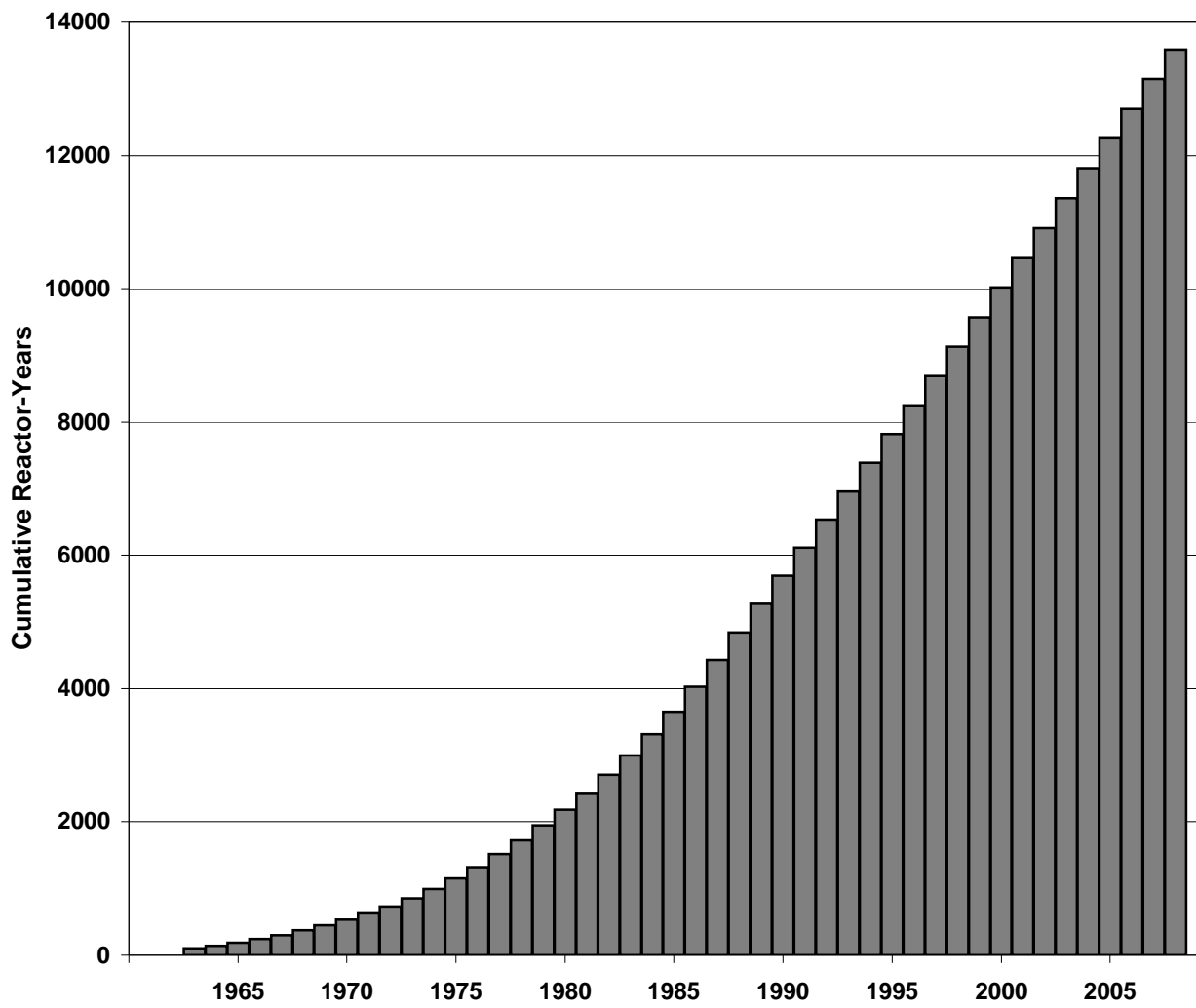
ABBATOM	ABBATOM (formerly ASEA-ATOM)
ACECOWEN	ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE )
ACLF	(ACECOWEN - CREUSOT LOIRE - FRAMATOME)
AECL	ATOMIC ENERGY OF CANADA LTD.
AECL/DAE	ATOMIC ENERGY OF CANADA Ltda AND DEPARTMENT OF ATOMIC ENERGY(INDIA)
AECL/DHI	ATOMIC ENERGY OF CANADA LTD./DOOSAN HEAVY INDUSTRY & CONSTRUCTION
AEE	ATOMENERGOEXPORT
APC	ATOMIC POWER CONSTRUCTION LTD.
ASEASTAL	ASEA-ATOM / STAL-LAVAL
B&W	BABCOCK & WILCOX CO.
BBC	BROWN BOVERI ET CIE
CE	COMBUSTION ENGINEERING CO.
CGE	CANADIAN GENERAL ELECTRIC
CNCLNEY	CNIM-CONSTRUCTIONS NAVALES ET INDUSTRIELLES DE MEDITERRANEE CL - CREUSOT LOIRE , NEY - NEYRPIE
CNNC	CHINA NATIONAL NUCLEAR CORPORATION
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.



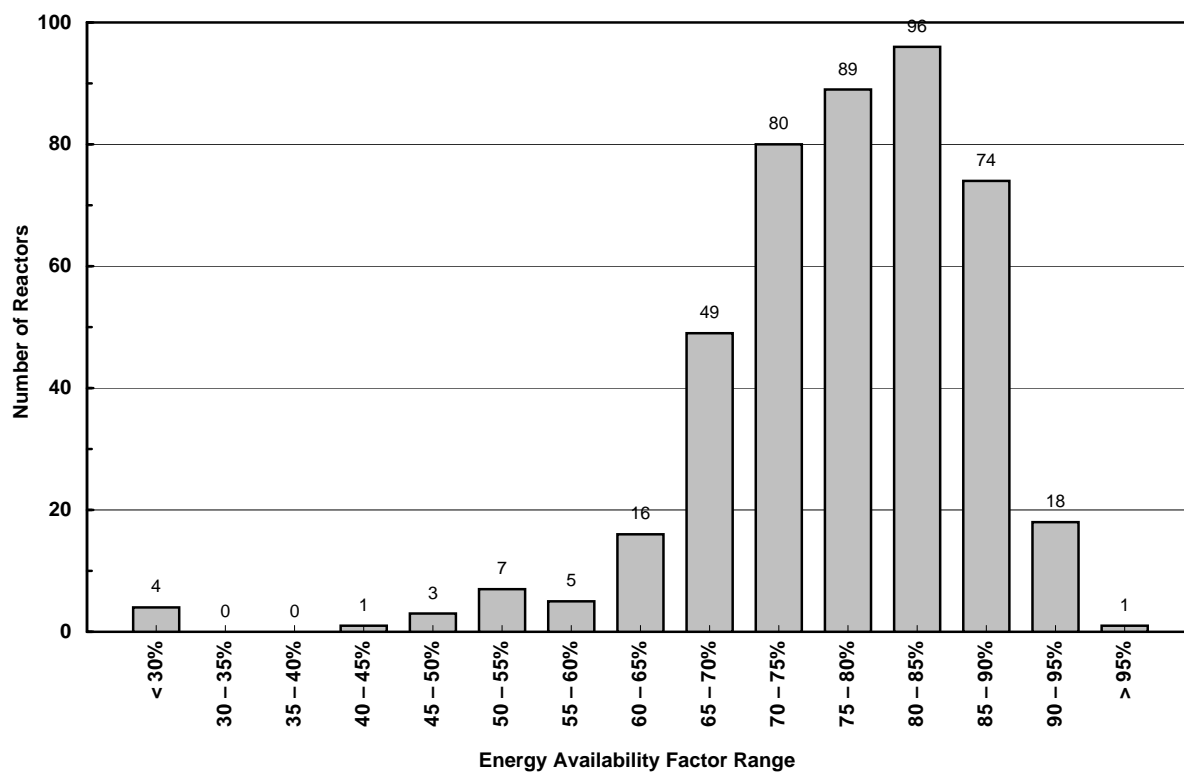
FAEA	Federal Atomic Energy Agency
FRAM	FRAMATOME
FRAMACEC	FRAMACECO ( FRAMATOME-ACEC-COCKERILL )
GE	GENERAL ELECTRIC CO.
GE/GETSC	GENERAL ELECTRIC CO. / GENERAL ELECTRIC TECHNICAL SERVICES CO.
GE/T	GENERAL ELECTRIC CO. / TOSHIBA CORPORATION
GEC	GENERAL ELECTRIC COMPANY (UK)
GETSCO	GENERAL ELECTRIC TECHNICAL 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.
NEI.P	NEI PARSONS
NNC	NATIONAL NUCLEAR CORPORATION
NPC	NUCLEAR POWER CO. LTD.
NPCIL	NUCLEAR POWER CORPORATION OF INDIA LTD. Vikram Sarabhai Bhavan, Anushakti Nagar, Mumbai - 400 094.
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
S/KWU	SIEMENS/KRAFTWERK UNION AG
SIEMENS	Siemens AG, Power Generation -FRG
SKODA	SKODA CONCERN NUCLEAR POWER PLANT WORKS
TNPG	THE NUCLEAR POWER GROUP LTD.
TOSHIBA	TOSHIBA CORPORATION
WH	WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS
WH/MHI	WESTINGHOUSE ELECTRIC CORPORATION / MITSUBISHI HEAVY INDUSTRIES LTD.

## **4. FIGURES**

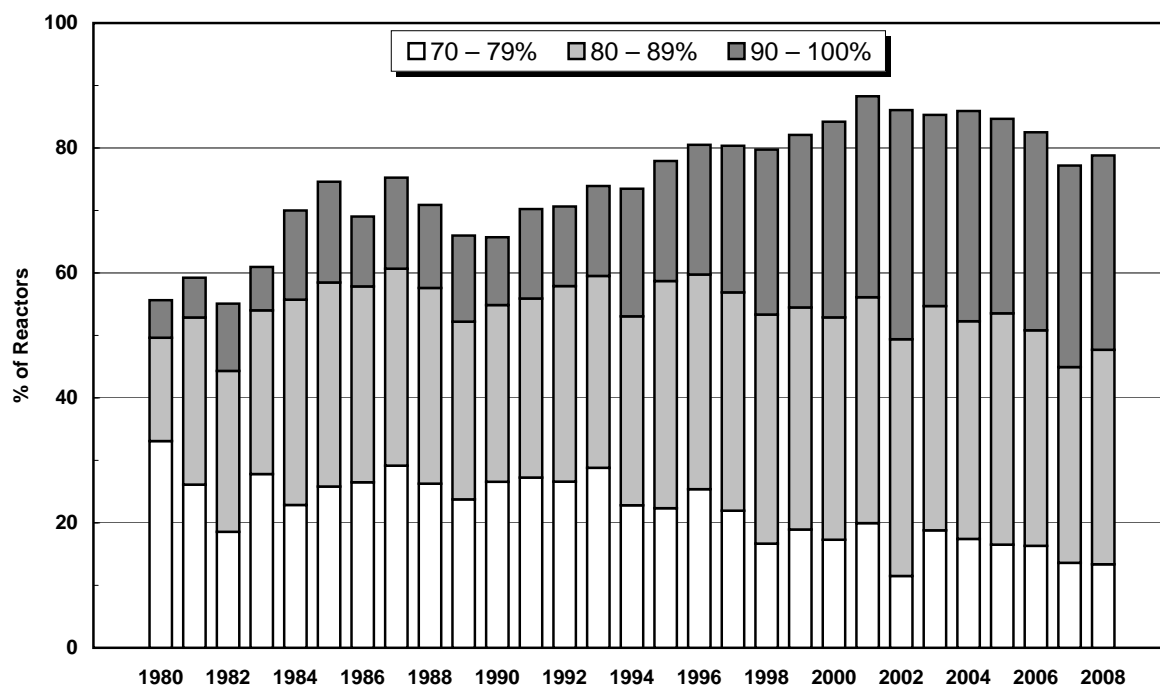
1. Nuclear Power Reactors Operating Experience Years
2. Lifetime Energy Availability Factors up to 2008
3. Reactors with High Availability Factors for years 1980-2008
4. Average Energy Availability Factors for years 1990-2008
5. Number of Reactors in Operation (as of 1 January 2009)
6. Number of Reactors by Age (as of 1 January 2009)



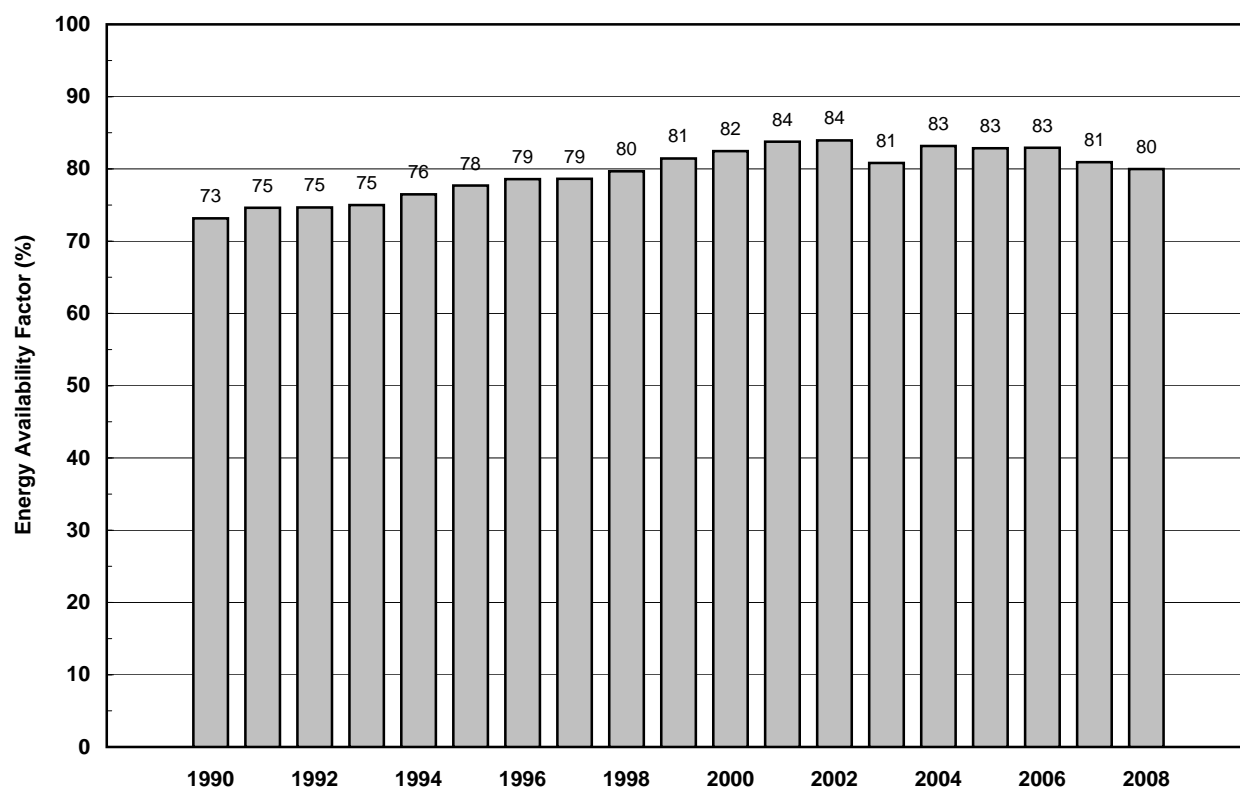
**Figure 1 — Nuclear Power Reactors Operating Experience**



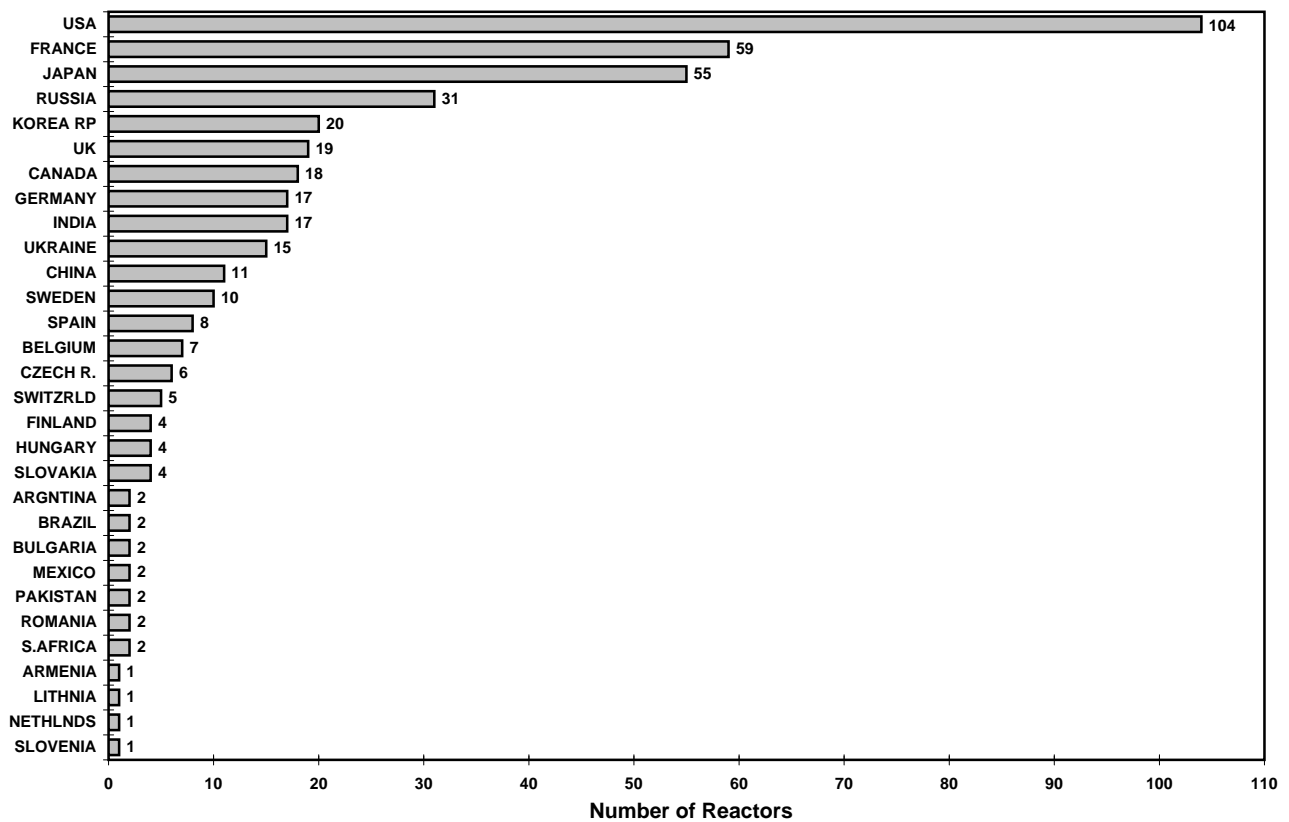
**Figure 2 — Lifetime Energy Availability Factors up to 2008**



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

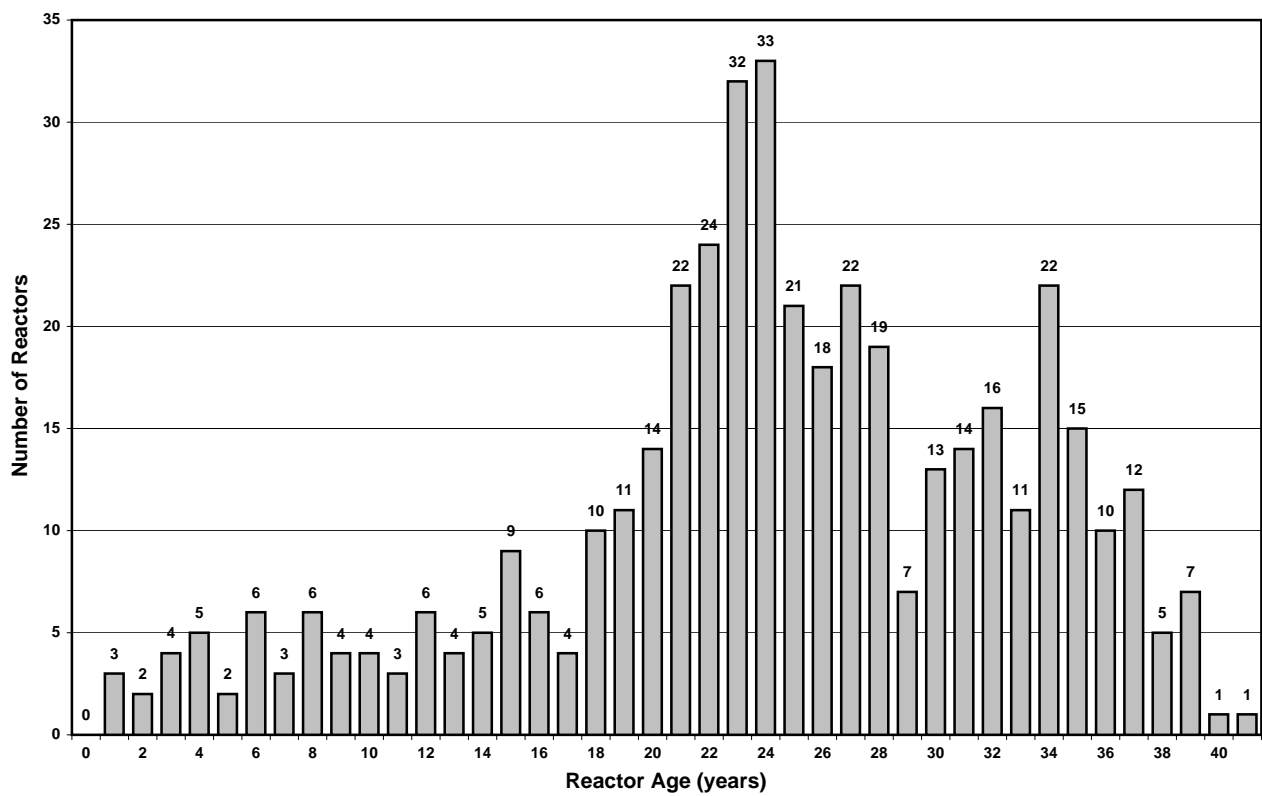


**Figure 4 — Average Energy Availability Factors**



**Figure 5 — Number of Reactors in Operation (as of 1 January 2009)**

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



**Figure 6 — Number of Reactors by Age (as of 1 January 2009)**



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

<u>COUNTRY</u>	<u>NUMBER OF REACTORS</u>
ARGENTINA	2
ARMENIA	1
BELGIUM	7
BRAZIL	2
BULGARIA	2
CANADA	18
CHINA	17
MAINLAND	11
TAIWAN, CHINA	6
CZECH REPUBLIC	6
FINLAND	4
FRANCE	59
GERMANY	17
HUNGARY	4
INDIA	17
JAPAN	55
KOREA, REPUBLIC OF	20
LITHUANIA, REPUBLIC OF	1
MEXICO	2
NETHERLANDS	1
PAKISTAN	2
ROMANIA	2
RUSSIAN FEDERATION	31
SLOVAK REPUBLIC	5
SLOVENIA	1
SOUTH AFRICA	2
SPAIN	8
SWEDEN	10
SWITZERLAND	5
UKRAINE	15
UNITED KINGDOM	19
UNITED STATES OF AMERICA	104

## AR-1 ATUCHA-1

**Operator:** NASA (NUCLEOELECTRICA ARGENTINA S.A.)  
**Contractor:** SIEMENS (Siemens AG, Power Generation -FRG)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 335.0 MW(e)  
**Design Net Capacity:** 319.0 MW(e)  
**Design Discharge Burnup:** 6000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 2481.3 GW(e).h  
**Energy Availability Factor:** 85.2%  
**Load Factor:** 84.6%  
**Operating Factor:** 86.3%  
**Energy Unavailability Factor:** 14.8%  
**Total Off-line Time:** 1198 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	240.7	206.7	54.5	57.1	235.7	220.8	248.4	249.7	241.1	247.0	237.4	241.9	2481.3
<b>EAF (%)</b>	100.0	91.1	22.8	23.7	94.5	91.6	99.3	100.0	100.0	100.0	100.0	99.3	85.2
<b>UCF (%)</b>	100.0	91.1	22.8	23.7	94.5	91.6	99.3	100.0	100.0	100.0	100.0	99.3	85.2
<b>LF (%)</b>	96.6	91.8	21.9	23.7	94.6	91.6	99.7	100.2	100.0	99.0	98.4	97.1	84.6
<b>OF (%)</b>	100.0	96.4	22.4	27.8	96.4	93.1	100.0	100.0	100.0	99.9	100.0	100.0	86.3
<b>EUF (%)</b>	0.0	8.9	77.2	76.3	5.5	8.4	0.7	0.0	0.0	0.0	0.0	0.7	14.8
<b>PUF (%)</b>	0.0	0.0	77.2	73.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.6
<b>UCLF (%)</b>	0.0	8.9	0.0	2.8	5.5	8.4	0.7	0.0	0.0	0.0	0.0	0.7	2.2
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jun 1968	<b>Lifetime Generation:</b>	69961.9 GW(e).h
<b>Date of First Criticality:</b>	13 Jan 1974	<b>Cumulative Energy Availability Factor:</b>	71.7%
<b>Date of Grid Connection:</b>	19 Mar 1974	<b>Cumulative Load Factor:</b>	69.1%
<b>Date of Commercial Operation:</b>	24 Jun 1974	<b>Cumulative Unit Capability Factor:</b>	72.9%
		<b>Cumulative Energy Unavailability Factor:</b>	28.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	831.3	321.0	51.5	51.5	50.7	50.7	50.7	50.7	3592	69.9
1975	2357.8	319.0	85.6	73.0	85.6	72.7	84.4	71.9	7730	88.2
1976	2408.6	319.0	86.9	78.4	86.9	78.2	86.0	77.4	7808	88.9
1977	1537.0	336.0	53.0	71.0	53.0	70.9	52.1	70.1	4650	53.1
1978	2711.8	345.0	90.9	75.6	90.9	75.5	89.7	74.6	8026	91.6
1979	2503.7	335.0	84.1	77.1	84.1	77.1	85.3	76.5	7551	86.2
1980	2180.5	335.0	73.5	76.6	73.5	76.5	74.1	76.2	6947	79.1
1981	2647.6	335.0	89.7	78.3	89.7	78.3	90.2	78.0	8120	92.7
1982	1753.6	335.0	59.2	76.1	59.2	76.0	59.8	75.9	5600	63.9
1983	2356.0	335.0	78.4	76.3	78.4	76.3	80.3	76.3	8101	92.5
1984	1706.1	335.0	98.7	78.4	98.7	78.4	58.0	74.6	8678	98.8
1985	1470.5	335.0	91.6	79.6	91.6	79.6	50.1	72.5	7159	81.7
1986	2205.0	335.0	75.8	79.3	75.8	79.3	75.1	72.7	7532	86.0
1987	1405.8	335.0	49.2	77.1	49.2	77.0	47.9	70.8	4391	50.1
1988	808.1	335.0	27.1	73.6	27.1	73.6	27.5	67.8	2515	28.6
1989	0.0	335.0	0.0	68.9	0.0	68.8	0.0	63.5	0	0.0
1990	1722.6	335.0	84.9	69.8	58.7	68.2	58.7	63.2	7201	82.2
1991	2721.9	335.0	92.6	71.1	92.6	69.6	92.8	64.9	8390	95.8
1992	2230.2	335.0	76.3	71.4	76.3	70.0	75.8	65.5	7089	80.7
1993	2403.7	335.0	82.2	72.0	82.2	70.6	81.9	66.3	7287	83.2
1994	2651.9	335.0	90.4	72.9	90.4	71.6	90.4	67.5	7916	90.4
1995	2671.7	335.0	92.3	73.8	92.3	72.5	91.0	68.6	8376	95.6
1996	2038.8	335.0	70.6	73.6	70.6	72.4	69.3	68.6	6990	79.6
1997	2720.1	335.0	93.4	74.5	93.4	73.3	92.7	69.6	8329	95.1
1998	2374.4	335.0	81.4	74.7	81.3	73.7	80.9	70.1	7242	82.7
1999	1395.5	335.0	47.8	73.7	47.8	72.6	47.6	69.2	4364	49.8
2000	1677.9	335.0	72.8	73.7	56.8	72.0	57.0	68.7	5038	57.4
2001	1426.0	335.0	48.7	72.8	48.7	71.2	48.6	68.0	4407	50.3
2002	1011.5	335.0	34.6	71.4	34.6	69.9	34.5	66.8	3030	34.6
2003	2020.6	335.0	68.8	71.3	68.8	69.9	68.9	66.9	6094	69.6
2004	2725.0	335.0	92.2	72.0	92.2	70.6	92.6	67.7	8250	93.9
2005	1998.0	335.0	68.5	71.9	68.5	70.5	68.1	67.8	7004	80.0
2006	2100.5	335.0	72.1	71.9	72.1	70.6	71.6	67.9	6403	73.1
2007	2718.7	335.0	94.0	72.6	93.8	71.3	92.6	68.6	8300	94.7
2008	2481.3	335.0	85.2	72.9	85.2	71.7	84.6	69.1	7562	86.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		145			778	1
B. Refuelling without a maintenance outage					12	
C. Inspection, maintenance or repair combined with refuelling				38		
D. Inspection, maintenance or repair without refuelling	1076			1114		
E. Testing of plant systems or component				5		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				40		
H. Nuclear regulatory requirement					41	39
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					14	48
Subtotal	1076	145	0	1197	845	90
Total		1221			2132	

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		120
12. Reactor I&C Systems		51
13. Reactor Auxiliary System:		169
14. Safety Systems	50	36
15. Reactor Cooling System:		192
16. Steam generation system:		60
17. Safety I&C Systems (excluding reactor I&C)		12
31. Turbine and auxiliaries:	48	10
32. Feedwater and Main Steam System		24
33. Circulating Water System		8
41. Main Generator System:		5
42. Electrical Power Supply System:	47	65
Total	145	752

## 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 4368.6 GW(e).h  
 Energy Availability Factor: 82.8%  
 Load Factor: 83.1%  
 Operating Factor: 84.3%  
 Energy Unavailability Factor: 17.2%  
 Total Off-line Time: 1378 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	438.2	410.0	439.0	425.9	443.3	404.1	444.6	444.4	429.6	243.6	0.0	245.8	4368.6
EAF (%)	98.2	98.1	98.2	98.6	99.3	93.5	99.6	99.6	99.4	54.8	0.0	55.1	82.8
UCF (%)	98.2	98.1	98.2	98.6	99.3	93.5	99.6	99.6	99.4	54.8	0.0	55.1	82.8
LF (%)	98.2	101.7	98.3	98.7	99.3	93.5	99.6	99.6	99.4	54.5	0.0	55.1	83.1
OF (%)	100.0	103.6	100.1	100.1	100.0	94.3	100.0	100.0	100.0	55.0	0.0	58.6	84.3
EUf (%)	1.8	1.9	1.8	1.4	0.7	6.5	0.4	0.4	0.6	45.2	100.0	44.9	17.2
PUF (%)	0.8	0.8	0.8	0.8	0.7	0.0	0.4	0.4	0.6	45.2	100.0	0.0	12.5
UCLF (%)	1.1	1.1	1.0	0.6	0.0	6.5	0.0	0.0	0.0	0.0	0.0	44.9	4.7
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. 2008 Summary of Operation

THE 2008 LOAD FACTOR WAS 82,96%A PLANNED OUTAGE WAS PERFORMED DURING OCTOBER - NOVEMBER

### 5. Historical Summary

Date of Construction Start: 01 Apr 1974      Lifetime Generation: 112079.3 GW(e).h  
 Date of First Criticality: 13 Mar 1983      Cumulative Energy Availability Factor: 86.7%  
 Date of Grid Connection: 25 Apr 1983      Cumulative Load Factor: 84.3%  
 Date of Commercial Operation: 20 Jan 1984      Cumulative Unit Capability Factor: 87.2%  
    Cumulative Energy Unavailability Factor: 13.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	2527.1	600.0	70.3	70.3	69.9	69.9	47.9	47.9	6355	72.3
1985	3778.6	600.0	93.4	81.9	93.4	81.6	71.9	59.9	8170	93.3
1986	3061.7	600.0	67.1	77.0	66.3	76.5	58.3	59.4	5847	66.7
1987	4577.0	600.0	87.9	79.7	87.9	79.4	87.1	66.3	7951	90.8
1988	4560.6	600.0	88.8	81.5	88.8	81.3	86.5	70.3	7798	88.8
1989	4659.0	600.0	90.1	82.9	89.1	82.6	88.6	73.4	7804	89.1
1990	5000.7	600.0	96.5	84.9	95.1	84.4	95.1	76.5	8404	95.9
1991	4498.8	600.0	89.7	85.5	85.8	84.5	85.6	77.6	7855	89.7
1992	4354.0	600.0	83.4	85.2	81.6	84.2	82.6	78.2	7440	84.7
1993	4773.3	600.0	90.7	85.8	90.6	84.8	90.8	79.4	7956	90.8
1994	5157.9	600.0	98.3	86.9	97.8	86.0	98.1	81.1	8575	97.9
1995	3897.9	600.0	74.3	85.9	74.3	85.1	74.2	80.6	6541	74.7
1996	4892.0	600.0	92.8	86.4	92.8	85.6	92.8	81.5	8176	93.1
1997	4737.0	600.0	89.3	86.6	89.3	85.9	90.1	82.1	7821	89.3
1998	4555.4	600.0	86.9	86.6	86.9	86.0	86.7	82.4	7629	87.1
1999	5201.8	598.0	99.1	87.4	99.1	86.8	99.3	83.5	8700	99.3
2000	4064.5	643.0	78.2	86.8	78.1	86.2	72.0	82.8	6837	77.8
2001	5128.1	600.0	97.5	87.4	97.4	86.9	97.6	83.6	8564	97.8
2002	4385.5	600.0	84.0	87.2	83.4	86.7	83.4	83.6	7401	84.5
2003	5004.1	600.0	95.1	87.6	95.1	87.1	95.2	84.1	8367	95.5
2004	4589.6	600.0	87.5	87.6	87.5	87.1	87.1	84.3	7704	87.7
2005	4372.5	600.0	83.3	87.4	83.3	86.9	83.2	84.2	7341	83.8
2006	5052.1	600.0	96.2	87.8	96.2	87.3	96.1	84.7	8455	96.5
2007	4003.7	600.0	76.5	87.3	76.5	86.9	76.2	84.4	6771	77.3
2008	4368.6	600.0	82.8	87.2	82.8	86.7	83.1	84.3	7382	84.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		344		6	265	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				92		
D. Inspection, maintenance or repair without refuelling	1059			680		
E. Testing of plant systems or component				55	1	
H. Nuclear regulatory requirement				8	1	
J. Grid limitation, failure or grid unavailability					1	18
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	
L. Human factor related					1	
Subtotal	1059	344	0	841	272	18
Total		1403			1131	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		42
15. Reactor Cooling System		22
16. Steam generation system		83
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	1	35
32. Feedwater and Main Steam System		26
33. Circulating Water System		1
41. Main Generator System	302	34
42. Electrical Power Supply System	41	7
Total	344	264

## AM-19 ARMENIA-2

**Operator:** ANPPJSC (Joint Stock Company Armenian NPP)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 376.0 MW(e)  
**Design Net Capacity:** 376.0 MW(e)  
**Design Discharge Burnup:** 28600 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 2265.9 GW(e).h  
**Energy Availability Factor:** 68.9%  
**Load Factor:** 68.8%  
**Operating Factor:** 80.1%  
**Energy Unavailability Factor:** 31.1%  
**Total Off-line Time:** 1747 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	265.7	240.1	241.9	186.7	238.4	235.2	234.2	229.5	29.2	0.0	106.7	258.2	2265.9
<b>EAF (%)</b>	89.3	87.8	86.4	70.7	86.9	90.5	88.2	86.6	10.9	0.0	39.8	89.9	68.9
<b>UCF (%)</b>	89.3	87.8	86.4	70.7	86.9	90.5	88.2	86.6	10.9	0.0	39.8	90.0	68.9
<b>LF (%)</b>	95.0	95.0	86.5	69.1	85.2	86.9	83.7	82.0	10.8	0.0	39.4	92.3	68.8
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	13.5	0.0	43.9	100.0	80.1
<b>EUF (%)</b>	10.7	12.2	13.6	29.3	13.1	9.5	11.8	13.4	89.1	100.0	60.2	10.1	31.1
<b>PUF (%)</b>	8.0	8.0	8.0	25.2	12.0	8.0	8.0	8.0	87.6	100.0	59.6	8.0	28.3
<b>UCLF (%)</b>	2.7	4.3	5.6	4.1	1.2	1.6	3.8	5.4	1.5	0.0	0.6	2.1	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. 2008 Summary of Operation

ON 5 OF SEPTEMBER, 2008, UNIT 2 OF THE ANPP WAS PUT OUT OF OPERATION FOR 85 DAYS OF OUTAGE FOR ITS 2008 PREVENTIVE MAINTENANCE. ON 17 OF NOVEMBER, HOWEVER, THANKS TO THE EFFORTS OF THE ANPP OPERATIONAL PERSONNEL IT WAS PUT INTO OPERATION AND CONNECTED TO THE GRID 11 DAYS EARLIER THAN IT WAS PLANNED.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jul 1975	<b>Lifetime Generation:</b>	48811.9 GW(e).h
<b>Date of First Criticality:</b>	01 Jan 1980	<b>Cumulative Energy Availability Factor:</b>	64.4%
<b>Date of Grid Connection:</b>	05 Jan 1980	<b>Cumulative Load Factor:</b>	63.0%
<b>Date of Commercial Operation:</b>	03 May 1980	<b>Cumulative Unit Capability Factor:</b>	66.4%
		<b>Cumulative Energy Unavailability Factor:</b>	35.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	Data not provided									
1981	"									
1982	"									
1983	"									
1984	"									
1985	"									
1986	"									
1987	2629.1	408.0	79.3	79.3	79.3	79.3	73.6	73.6	7040	80.4
1988	2254.5	376.0	73.4	76.5	73.4	76.5	68.3	71.0	6741	76.7
1989	671.3	376.0	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	376.0	86.2	81.1	63.6	74.3	63.5	69.6	7561	86.1
1997	1430.0	376.0	43.4	72.4	43.4	67.2	43.4	63.6	5700	65.1
1998	1416.5	376.0	44.6	67.2	44.6	63.0	43.0	59.7	6408	73.2
1999	1890.4	376.0	57.4	65.7	57.4	62.1	57.4	59.4	6193	70.7
2000	1841.5	376.0	55.8	64.3	55.8	61.2	55.8	58.9	5699	64.9
2001	1815.4	376.0	55.1	63.2	55.1	60.5	55.1	58.4	5660	64.6
2002	2078.9	376.0	63.3	63.2	63.2	60.8	63.1	58.9	6961	79.5
2003	1997.6	376.0	63.4	63.2	60.6	60.8	60.6	59.1	6120	69.9
2004	2196.6	376.0	70.3	63.9	64.2	61.1	66.5	59.7	7135	81.2
2005	2504.5	376.0	76.3	64.9	76.3	62.3	76.0	61.1	7658	87.4
2006	2421.6	376.0	76.1	65.7	76.1	63.3	73.5	62.0	7632	87.1
2007	2347.8	376.0	73.8	66.3	73.8	64.1	71.3	62.6	7447	85.0
2008	2265.9	376.0	68.9	66.4	68.9	64.4	68.8	63.0	7013	80.1



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					66	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1771			974		
D. Inspection, maintenance or repair without refuelling				96		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				71		
J. Grid limitation, failure or grid unavailability					0	11
Subtotal	1771	0	0	1141	68	11
Total		1771			1220	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		0
13. Reactor Auxiliary System:		10
15. Reactor Cooling System:		6
16. Steam generation system:		9
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries:		1
41. Main Generator System:		1
42. Electrical Power Supply System:		3
Total	0	31

## BE-2 DOEL-1

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 392.0 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 2008

**Net Energy Production:** 2690.3 GW(e).h  
**Energy Availability Factor:** 77.2%  
**Load Factor:** 78.3%  
**Operating Factor:** 78.2%  
**Energy Unavailability Factor:** 22.8%  
**Total Off-line Time:** 1913 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	296.2	278.2	287.8	231.7	0.0	198.4	278.5	271.7	282.6	293.0	0.0	272.2	2690.3
<b>EAF (%)</b>	100.0	100.0	97.3	80.6	0.0	69.8	95.7	93.9	100.0	98.7	0.0	91.0	77.2
<b>UCF (%)</b>	100.0	100.0	97.3	80.6	0.0	69.8	95.7	93.9	100.0	98.7	0.0	91.0	77.2
<b>LF (%)</b>	101.6	105.6	98.7	82.2	0.0	70.3	95.5	93.2	100.1	100.3	0.0	93.3	78.3
<b>OF (%)</b>	100.0	103.6	98.8	81.9	0.0	70.6	96.2	94.4	100.0	99.2	0.0	93.8	78.2
<b>EUF (%)</b>	0.0	0.0	2.7	19.4	100.0	30.2	4.3	6.1	0.0	1.3	100.0	9.0	22.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	26.9	0.0	0.0	0.0	1.3	100.0	2.8	10.8
<b>UCLF (%)</b>	0.0	0.0	2.7	19.4	100.0	3.3	4.3	6.1	0.0	0.0	0.0	6.2	12.0
<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. 2008 Summary of Operation

11-03 TO 12-03: SCRAM ;10-04 TO 11-04: SHUTDOWN FOR A STEAMLEAKAGE FEED WATER SYSTEM ;26-04 TO 09-06: SCRAM AND SHUTDOWN FOR THE PERFORMANCE OF PERIODIC TESTS ON THE SAFETY INJECTION SYSTEM ;03-07 TO 04-07: SHUTDOWN TO REPAIR THE REGULATION OIL CIRCUIT OF THE TURBINE ;19-08 TO 21-08: SHUTDOWN TO REPAIR THE REGULATION OIL CIRCUIT OF THE TURBINE ;31-10 TO 02-12 : REFUELING OUTAGE

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jul 1969	<b>Lifetime Generation:</b>	100551.8 GW(e).h
<b>Date of First Criticality:</b>	18 Jul 1974	<b>Cumulative Energy Availability Factor:</b>	85.2%
<b>Date of Grid Connection:</b>	28 Aug 1974	<b>Cumulative Load Factor:</b>	85.5%
<b>Date of Commercial Operation:</b>	15 Feb 1975	<b>Cumulative Unit Capability Factor:</b>	86.1%
		<b>Cumulative Energy Unavailability Factor:</b>	14.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	2407.2	392.0	76.6	76.6	76.6	76.6	76.6	76.6	6672	83.2
1976	2667.1	395.0	75.5	76.0	75.5	76.0	76.9	76.7	6928	78.9
1977	2830.0	395.0	81.8	78.0	81.8	78.0	81.8	78.5	7332	83.7
1978	2731.2	395.0	78.9	78.2	78.9	78.2	78.9	78.6	7071	80.7
1979	3037.0	395.0	86.4	79.9	86.4	79.9	87.8	80.5	7812	89.2
1980	2901.0	395.0	84.4	80.6	84.4	80.6	83.6	81.0	7596	86.5
1981	2946.0	395.0	85.0	81.3	85.0	81.3	85.1	81.6	7644	87.3
1982	3184.5	395.0	91.2	82.5	91.2	82.5	92.0	82.9	8103	92.5
1983	2823.0	393.0	81.8	82.4	81.8	82.4	82.0	82.8	7316	83.5
1984	3129.0	393.0	90.2	83.2	90.2	83.2	90.6	83.6	7988	90.9
1985	2896.3	392.0	82.4	83.2	82.4	83.2	84.3	83.7	7330	83.7
1986	2685.9	392.0	79.1	82.8	78.8	82.8	78.2	83.2	7040	80.4
1987	2928.4	400.0	85.5	83.0	85.4	83.0	83.6	83.2	7306	83.4
1988	2694.1	400.0	86.6	83.3	81.3	82.9	76.7	82.8	7686	87.5
1989	2513.1	400.0	73.6	82.6	71.9	82.1	71.7	82.0	6475	73.9
1990	2859.9	400.0	85.6	82.8	83.5	82.2	81.6	82.0	7380	84.2
1991	3061.4	400.0	89.5	83.2	89.2	82.6	87.4	82.3	7860	89.7
1992	2990.5	400.0	87.7	83.5	86.5	82.9	85.1	82.5	7741	88.1
1993	2908.9	400.0	86.0	83.6	84.4	82.9	83.0	82.5	7580	86.5
1994	2921.8	400.0	88.7	83.9	84.3	83.0	83.4	82.5	7635	87.2
1995	2791.5	392.0	82.7	83.8	81.0	82.9	81.3	82.5	7342	83.8
1996	3169.4	392.0	91.5	84.2	91.3	83.3	92.0	82.9	8141	92.7
1997	3113.8	392.0	89.0	84.4	88.9	83.5	90.7	83.3	7899	90.2
1998	3292.5	392.0	94.1	84.8	93.7	84.0	95.9	83.8	8277	94.5
1999	3196.8	392.0	92.6	85.1	91.1	84.2	93.1	84.1	8123	92.7
2000	3264.8	392.0	94.2	85.4	92.3	84.6	94.8	84.6	8317	94.7
2001	3157.6	392.0	91.4	85.6	90.5	84.8	91.9	84.8	8098	92.4
2002	3260.7	392.0	93.4	85.9	93.3	85.1	95.0	85.2	8308	94.8
2003	3024.6	392.0	90.3	86.1	86.4	85.1	88.1	85.3	7953	90.8
2004	2989.1	392.0	87.6	86.1	85.5	85.1	86.8	85.3	7742	88.1
2005	3062.6	392.0	89.1	86.2	88.0	85.2	89.2	85.5	7849	89.6
2006	3100.5	392.0	91.1	86.4	89.2	85.3	90.3	85.6	8030	91.7
2007	3029.0	392.0	87.7	86.4	87.6	85.4	88.2	85.7	7709	88.0
2008	2690.3	392.0	77.2	86.1	77.2	85.2	78.3	85.5	6847	78.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		968			187	
B. Refuelling without a maintenance outage					2	
C. Inspection, maintenance or repair combined with refuelling	726			775		
D. Inspection, maintenance or repair without refuelling				7		
E. Testing of plant systems or component	196			34	1	
H. Nuclear regulatory requirement					6	
J. Grid limitation, failure or grid unavailability						6
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				24	45	
L. Human factor related		53			10	
P. Fire					0	
Z. Others					0	
Subtotal	922	1021	0	840	251	6
Total	1943			1097		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		12
14. Safety Systems		9
15. Reactor Cooling System	875	14
16. Steam generation system		41
31. Turbine and auxiliaries	69	69
32. Feedwater and Main Steam System	22	20
33. Circulating Water System		0
41. Main Generator System		6
42. Electrical Power Supply System		0
Total	966	181

## BE-4 DOEL-2

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3478.9 GW(e).h  
**Energy Availability Factor:** 90.2%  
**Load Factor:** 91.7%  
**Operating Factor:** 91.3%  
**Energy Unavailability Factor:** 9.8%  
**Total Off-line Time:** 760 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	329.6	291.1	329.2	315.7	214.3	73.0	321.9	323.3	306.8	328.9	316.5	328.5	3478.9
<b>EAF (%)</b>	100.0	94.3	100.0	100.0	66.6	23.4	100.0	100.0	97.8	100.0	100.0	100.0	90.2
<b>UCF (%)</b>	100.0	94.3	100.0	100.0	66.6	23.4	100.0	100.0	97.8	100.0	100.0	100.0	90.2
<b>LF (%)</b>	102.3	100.1	102.2	101.4	66.5	23.4	99.9	100.4	98.4	102.0	101.5	102.0	91.7
<b>OF (%)</b>	100.0	101.5	99.9	100.1	66.8	27.4	100.0	100.0	100.0	100.0	100.0	100.0	91.3
<b>EUF (%)</b>	0.0	5.7	0.0	0.0	33.4	76.6	0.0	0.0	2.2	0.0	0.0	0.0	9.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	33.4	76.6	0.0	0.0	0.0	0.0	0.0	0.0	9.1
<b>UCLF (%)</b>	0.0	5.7	0.0	0.0	0.0	0.0	0.0	0.0	2.2	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. 2008 Summary of Operation

02-02 TO 03-02: SCRAM AND SHUTDOWN TO REPAIR LEAKAGE IN THE STEAM PIPING TO THE TURBINE

;21-05 TO 22-06: REFUELING OUTAGE

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Sep 1971	<b>Lifetime Generation:</b>	95376.1 GW(e).h
<b>Date of First Criticality:</b>	04 Aug 1975	<b>Cumulative Energy Availability Factor:</b>	81.5%
<b>Date of Grid Connection:</b>	21 Aug 1975	<b>Cumulative Load Factor:</b>	81.8%
<b>Date of Commercial Operation:</b>	01 Dec 1975	<b>Cumulative Unit Capability Factor:</b>	82.3%
		<b>Cumulative Energy Unavailability Factor:</b>	18.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	266.4	392.0	91.3	91.3	91.3	91.3	91.3	91.3	694	93.3
1976	2462.8	395.0	71.6	73.2	71.6	73.2	71.0	72.6	6519	74.2
1977	2576.8	395.0	74.3	73.7	74.3	73.7	74.5	73.5	6649	75.9
1978	2750.6	395.0	79.5	75.6	79.5	75.6	79.5	75.4	7114	81.2
1979	2593.3	395.0	74.6	75.3	74.6	75.3	74.9	75.3	6639	75.8
1980	2782.0	395.0	79.7	76.2	79.7	76.2	80.2	76.3	7111	81.0
1981	2841.7	395.0	81.4	77.1	81.4	77.1	82.1	77.2	7226	82.5
1982	2582.0	395.0	73.8	76.6	73.8	76.6	74.6	76.9	6598	75.3
1983	2017.0	393.0	58.0	74.3	58.0	74.3	58.6	74.6	5190	59.2
1984	2916.0	393.0	84.1	75.4	84.1	75.4	84.5	75.7	7508	85.5
1985	2908.7	392.0	83.0	76.1	83.0	76.1	84.7	76.6	7341	83.8
1986	2282.6	392.0	69.8	75.6	69.8	75.6	66.5	75.7	5891	67.2
1987	2616.4	400.0	77.8	75.8	76.8	75.7	74.7	75.6	6612	75.5
1988	2906.7	400.0	83.2	76.3	82.6	76.2	82.7	76.1	7408	84.3
1989	2479.8	400.0	71.8	76.0	70.8	75.8	70.8	75.8	6436	73.5
1990	1982.6	400.0	66.5	75.4	56.6	74.5	56.6	74.5	5170	59.0
1991	2779.8	400.0	81.2	75.7	81.0	74.9	79.3	74.8	7136	81.5
1992	2971.9	400.0	86.3	76.4	86.1	75.6	84.6	75.4	7617	86.7
1993	2949.5	400.0	85.9	76.9	85.7	76.2	84.2	75.9	7551	86.2
1994	2982.4	392.0	87.3	77.4	86.2	76.7	86.9	76.4	7810	89.2
1995	2867.5	392.0	82.9	77.7	82.7	77.0	83.5	76.8	7342	83.8
1996	2888.8	392.0	83.4	78.0	83.1	77.3	83.9	77.1	7390	84.1
1997	2935.0	392.0	87.7	78.4	84.5	77.6	85.5	77.5	7749	88.5
1998	3145.0	392.0	90.2	78.9	90.1	78.1	91.6	78.1	7987	91.2
1999	3091.7	392.0	89.6	79.4	88.9	78.6	90.0	78.6	7875	89.9
2000	3135.6	392.0	90.4	79.8	89.8	79.0	91.1	79.1	8022	91.3
2001	3150.5	392.0	90.9	80.2	90.3	79.4	91.7	79.6	8060	92.0
2002	3104.5	392.0	91.4	80.6	89.5	79.8	90.4	80.0	8076	92.2
2003	3142.6	392.0	93.1	81.1	90.1	80.2	91.5	80.4	8184	93.4
2004	2951.9	413.0	81.9	81.1	80.5	80.2	81.3	80.4	7174	81.7
2005	3506.7	433.0	91.3	81.5	90.8	80.6	92.4	80.8	8036	91.7
2006	3399.3	433.0	90.1	81.8	88.2	80.8	89.6	81.1	7954	90.8
2007	3483.1	433.0	90.8	82.1	90.8	81.2	91.8	81.5	7985	91.2
2008	3478.9	433.0	90.2	82.3	90.2	81.5	91.7	81.8	8000	91.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		14			311	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	769			816		
D. Inspection, maintenance or repair without refuelling				159		
E. Testing of plant systems or component				76	13	
J. Grid limitation, failure or grid unavailability						12
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				8	10	
L. Human factor related					3	
Z. Others					0	
Subtotal	769	14	0	1059	351	12
Total	783			1422		

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		10
13. Reactor Auxiliary Systems		8
14. Safety Systems		8
15. Reactor Cooling System	0	24
16. Steam generation system		88
31. Turbine and auxiliaries		86
32. Feedwater and Main Steam System	13	17
41. Main Generator System		12
42. Electrical Power Supply System		8
Total	13	265

## BE-5 DOEL-3

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6943.5 GW(e).h  
**Energy Availability Factor:** 78.5%  
**Load Factor:** 78.8%  
**Operating Factor:** 79.7%  
**Energy Unavailability Factor:** 21.5%  
**Total Off-line Time:** 1780 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	747.1	700.5	746.4	706.4	731.4	471.1	144.0	102.1	348.1	752.7	734.3	759.5	6943.5
<b>EAF (%)</b>	99.7	100.0	100.0	97.7	99.4	66.2	19.3	13.9	47.8	99.8	100.0	100.0	78.5
<b>UCF (%)</b>	99.7	100.0	100.0	97.7	99.4	66.2	19.3	13.9	47.8	99.8	100.0	100.0	78.5
<b>LF (%)</b>	99.8	103.6	99.7	97.7	97.7	65.0	19.2	13.6	48.1	100.4	101.4	101.5	78.8
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	66.7	25.0	14.0	49.2	100.0	100.0	100.0	79.7
<b>EUF (%)</b>	0.3	0.0	0.0	2.3	0.6	33.8	80.7	86.1	52.2	0.2	0.0	0.0	21.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.3	0.0	33.5	77.2	0.0	0.0	0.0	0.0	0.0	9.3
<b>UCLF (%)</b>	0.3	0.0	0.0	2.0	0.6	0.3	3.5	86.1	52.2	0.2	0.0	0.0	12.2
<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. 2008 Summary of Operation

21-06 TO 24-07: REFUELING OUTAGE ;05-08 TO 16-09: SHUTDOWN (WITH SCRAM) TO REPAIR THE SEAL OF REACTOR COOLANT PUMP



## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jan 1975	<b>Lifetime Generation:</b>	189581.5 GW(e).h
<b>Date of First Criticality:</b>	14 Jun 1982	<b>Cumulative Energy Availability Factor:</b>	85.8%
<b>Date of Grid Connection:</b>	23 Jun 1982	<b>Cumulative Load Factor:</b>	85.7%
<b>Date of Commercial Operation:</b>	01 Oct 1982	<b>Cumulative Unit Capability Factor:</b>	87.2%
		<b>Cumulative Energy Unavailability Factor:</b>	14.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1982	1764.0	944.0	88.8	88.8	88.8	88.8	88.8	88.8	2033	92.1
1983	6705.0	900.0	85.0	85.8	85.0	85.8	85.0	85.8	7807	89.1
1984	7074.0	900.0	89.5	87.5	89.5	87.5	89.5	87.4	8084	92.0
1985	6496.3	900.0	82.4	85.9	82.4	85.9	82.4	85.9	7515	85.8
1986	6860.0	897.0	88.5	86.5	88.5	86.5	87.3	86.2	8007	91.4
1987	5713.2	897.0	75.7	84.4	73.5	84.0	72.7	83.7	6905	78.8
1988	6777.5	890.0	88.7	85.1	85.9	84.3	86.7	84.1	7875	89.7
1989	5774.9	900.0	82.1	84.7	73.4	82.8	73.2	82.6	7470	85.3
1990	6811.8	900.0	89.9	85.3	86.4	83.3	86.4	83.1	8021	91.6
1991	6742.9	900.0	90.0	85.8	85.8	83.5	85.5	83.4	7913	90.3
1992	6732.2	900.0	92.3	86.5	90.1	84.2	85.2	83.5	7778	88.5
1993	5377.2	900.0	69.6	85.0	65.8	82.5	68.2	82.2	6198	70.8
1994	7482.3	970.0	88.4	85.3	87.7	83.0	88.1	82.7	7888	90.0
1995	7025.1	970.0	83.4	85.1	82.6	83.0	82.7	82.7	7396	84.4
1996	7334.2	993.0	84.4	85.1	83.8	83.0	84.0	82.8	7447	84.8
1997	8108.2	1006.0	93.5	85.7	91.9	83.7	92.0	83.4	8250	94.2
1998	8012.6	1006.0	92.0	86.1	90.9	84.2	90.9	83.9	8171	93.3
1999	8231.2	1006.0	94.8	86.6	93.4	84.7	93.4	84.5	8330	95.1
2000	7884.9	1006.0	89.3	86.8	89.0	85.0	89.2	84.8	7892	89.8
2001	7993.3	1006.0	90.9	87.0	90.2	85.3	90.7	85.1	7989	91.2
2002	7636.6	1006.0	86.7	87.0	86.2	85.3	86.7	85.2	7647	87.3
2003	7870.8	1006.0	89.8	87.1	89.7	85.5	89.3	85.4	7928	90.5
2004	7984.8	1006.0	91.6	87.4	90.8	85.8	90.4	85.7	8104	92.3
2005	7962.7	1006.0	92.4	87.6	91.1	86.0	90.4	85.9	8147	93.0
2006	7708.7	1006.0	88.2	87.6	87.3	86.1	87.5	85.9	7764	88.6
2007	7697.1	1006.0	87.2	87.6	87.1	86.1	87.3	86.0	7710	88.0
2008	6943.5	1006.0	78.5	87.2	78.5	85.8	78.8	85.7	6980	79.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1005			160	
B. Refuelling without a maintenance outage					0	
C. Inspection, maintenance or repair combined with refuelling	797			705	2	
D. Inspection, maintenance or repair without refuelling				8		
E. Testing of plant systems or component				0	1	
H. Nuclear regulatory requirement					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					10	
L. Human factor related					12	
P. Fire					0	
Subtotal	797	1005	0	713	186	0
Total		1802			899	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		2
13. Reactor Auxiliary System:		1
14. Safety Systems		0
15. Reactor Cooling System:		29
16. Steam generation system:		51
17. Safety I&C Systems (excluding reactor I&C)		17
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		15
41. Main Generator System:		7
42. Electrical Power Supply System:		5
Total	1005	156

**BE-7 DOEL-4****Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)**Contractor:** ACECOWEN (ACECOWEN ( ACEC-COCKERILL-WESTINGHOUSE ))**1. Station Details**

**Type:** PWR

**Net Reference Unit Power at the beginning of 2008:** 1008.0 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 2008**

**Net Energy Production:** 7466.7 GW(e).h

**Energy Availability Factor:** 85.2%

**Load Factor:** 84.6%

**Operating Factor:** 86.0%

**Energy Unavailability Factor:** 14.8%

**Total Off-line Time:** 1226 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	741.2	693.0	663.6	0.0	247.0	709.9	720.2	738.2	719.8	752.0	727.9	753.8	7466.7
<b>EAF (%)</b>	100.0	100.0	89.4	-0.1	33.4	99.8	99.9	99.9	99.9	100.0	100.0	100.0	85.2
<b>UCF (%)</b>	100.0	100.0	89.4	-0.1	33.4	99.8	99.9	99.9	100.0	100.0	100.0	100.0	85.2
<b>LF (%)</b>	98.8	102.3	88.5	0.0	32.9	97.8	96.0	98.4	99.2	100.1	100.3	100.5	84.6
<b>OF (%)</b>	100.0	103.6	89.2	0.0	39.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	86.0
<b>EUUF (%)</b>	0.0	0.0	10.6	100.1	66.6	0.2	0.1	0.1	0.1	0.0	0.0	0.0	14.8
<b>PUF (%)</b>	0.0	0.0	10.1	100.1	15.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4
<b>UCLF (%)</b>	0.0	0.0	0.6	0.0	50.9	0.2	0.1	0.1	0.1	0.0	0.0	0.0	4.4
<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. 2008 Summary of Operation**

28-03: SCRAM ;28-03 TO 04-05: REFUELING OUTAGE ;04-05 TO 19-05: REFUELING OUTAGE EXTENTION

**5. Historical Summary**

**Date of Construction Start:** 01 Dec 1978      **Lifetime Generation:** 173033.6 GW(e).h

**Date of First Criticality:** 31 Mar 1985      **Cumulative Energy Availability Factor:** 84.0%

**Date of Grid Connection:** 08 Apr 1985      **Cumulative Load Factor:** 83.8%

**Date of Commercial Operation:** 01 Jul 1985      **Cumulative Unit Capability Factor:** 84.8%

**Cumulative Energy Unavailability Factor:** 16.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	3574.9	981.0	82.6	82.6	82.6	82.6	82.6	82.6	3884	87.9
1986	7722.9	1006.0	87.8	86.1	87.8	86.1	87.6	86.0	7973	91.0
1987	6809.3	1006.0	81.4	84.2	77.0	82.4	77.3	82.5	7448	85.0
1988	7552.0	1000.0	87.6	85.2	85.9	83.4	86.0	83.5	7784	88.6
1989	7445.9	1010.0	87.4	85.7	84.4	83.7	84.2	83.6	7737	88.3
1990	7535.8	1010.0	88.2	86.1	85.3	83.9	85.2	83.9	7790	88.9
1991	7425.4	1010.0	84.8	85.9	84.1	84.0	83.9	83.9	7673	87.6
1992	7418.6	1010.0	86.7	86.0	85.9	84.2	83.6	83.9	7481	85.2
1993	6980.9	1010.0	79.6	85.3	78.9	83.6	78.9	83.3	7112	81.2
1994	3462.7	1001.0	39.2	80.4	39.2	78.9	39.5	78.7	3637	41.5
1995	6769.7	1001.0	76.9	80.1	76.8	78.7	77.2	78.6	7381	84.3
1996	6186.8	1001.0	70.6	79.3	69.9	78.0	70.4	77.8	6565	74.7
1997	7548.7	1001.0	87.1	79.9	87.0	78.7	86.1	78.5	7653	87.4
1998	7844.0	985.0	90.0	80.6	90.0	79.5	90.9	79.4	7998	91.3
1999	8008.4	985.0	92.5	81.4	92.4	80.4	92.8	80.3	8150	93.0
2000	7992.9	985.0	92.0	82.1	92.0	81.1	92.4	81.1	8323	94.8
2001	8098.9	985.0	93.3	82.8	93.2	81.8	93.9	81.8	8264	94.3
2002	7831.9	985.0	90.6	83.2	90.4	82.3	90.8	82.3	8017	91.5
2003	7781.2	985.0	91.1	83.6	90.5	82.8	90.2	82.8	8015	91.5
2004	7519.8	985.0	88.4	83.9	87.0	83.0	86.9	83.0	7843	89.3
2005	7394.8	985.0	86.1	84.0	85.9	83.1	85.7	83.1	7647	87.3
2006	7462.0	1008.0	86.5	84.1	86.2	83.3	84.5	83.2	7633	87.1
2007	8496.9	1008.0	98.1	84.7	98.1	83.9	96.2	83.8	8608	98.3
2008	7466.7	1008.0	85.2	84.8	85.2	84.0	84.6	83.8	7534	86.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					272	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	868			802		
D. Inspection, maintenance or repair without refuelling				28		
E. Testing of plant systems or component:				1	1	
H. Nuclear regulatory requirement		4				
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					50	0
L. Human factor related		379			11	
Subtotal	868	383	0	831	335	0
Total		1251			1166	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		1
14. Safety Systems		6
15. Reactor Cooling System:		24
16. Steam generation system:		211
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		12
33. Circulating Water System		0
41. Main Generator System:		4
42. Electrical Power Supply System:		2
Total	0	267

## BE-3 TIHANGE-1

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)

**Contractor:** ACLF ((ACECOWEN - CREUSOT LOIRE - FRAMATOME))

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7264.5 GW(e).h  
**Energy Availability Factor:** 85.2%  
**Load Factor:** 86.2%  
**Operating Factor:** 87.3%  
**Energy Unavailability Factor:** 14.8%  
**Total Off-line Time:** 1110 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	727.3	680.3	723.7	700.3	631.8	653.1	693.6	690.6	111.4	228.3	698.0	726.1	7264.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	88.3	94.3	96.9	96.5	16.1	31.9	100.0	99.2	85.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	89.7	95.9	100.0	100.0	16.8	35.6	100.0	100.0	86.5
<b>LF (%)</b>	101.6	105.2	101.1	101.2	88.3	94.3	96.9	96.5	16.1	31.9	100.8	101.5	86.2
<b>OF (%)</b>	100.0	103.6	99.9	100.1	91.4	97.5	100.0	100.0	17.4	38.7	100.0	100.0	87.3
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	11.7	5.7	3.1	3.5	83.9	68.1	0.0	0.8	14.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	83.2	62.1	0.0	0.0	12.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	10.3	4.1	0.0	0.0	0.0	2.3	0.0	0.0	1.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.4	1.6	3.1	3.5	0.8	3.7	0.0	0.8	1.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

SCRAM IN 05/2008, IN 06/2008 AND IN 10/2008 (2).

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jun 1970	<b>Lifetime Generation:</b>	221519.0 GW(e).h
<b>Date of First Criticality:</b>	21 Feb 1975	<b>Cumulative Energy Availability Factor:</b>	83.5%
<b>Date of Grid Connection:</b>	07 Mar 1975	<b>Cumulative Load Factor:</b>	83.1%
<b>Date of Commercial Operation:</b>	01 Oct 1975	<b>Cumulative Unit Capability Factor:</b>	86.0%
		<b>Cumulative Energy Unavailability Factor:</b>	16.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	1463.0	885.0	76.2	76.2	76.2	76.2	76.2	76.2	2087	94.5
1976	4409.5	870.0	89.8	87.0	57.5	61.3	57.7	61.4	6354	72.3
1977	5842.3	870.0	76.7	82.4	76.7	68.1	76.7	68.2	7234	82.6
1978	6371.0	870.0	84.3	83.0	84.3	73.1	83.6	72.9	7582	86.6
1979	5159.0	870.0	67.6	79.4	67.6	71.8	67.7	71.7	6121	69.9
1980	6173.0	870.0	80.7	79.6	80.7	73.5	80.8	73.4	7337	83.5
1981	6414.2	870.0	83.8	80.3	83.8	75.1	84.2	75.1	7762	88.6
1982	6164.8	870.0	80.8	80.4	80.8	75.9	80.9	75.9	7269	83.0
1983	5843.0	870.0	76.5	79.9	76.5	76.0	76.7	76.0	7135	81.4
1984	6374.0	870.0	83.4	80.3	83.4	76.8	83.4	76.8	7774	88.5
1985	5979.0	870.0	90.8	81.3	81.1	77.2	78.5	77.0	8077	92.2
1986	4005.0	870.0	59.2	79.3	54.8	75.2	52.6	74.8	5429	62.0
1987	7337.0	870.0	98.5	80.9	97.6	77.0	96.3	76.6	8733	99.7
1988	6310.0	870.0	84.9	81.2	83.9	77.6	82.6	77.0	7520	85.6
1989	6508.0	870.0	88.4	81.7	87.9	78.3	85.4	77.6	7854	89.7
1990	6683.0	870.0	90.9	82.3	88.4	78.9	87.7	78.3	8082	92.3
1991	6163.0	870.0	86.7	82.6	81.0	79.1	80.9	78.4	7714	88.1
1992	6059.0	870.0	80.5	82.5	79.1	79.1	79.3	78.5	7807	88.9
1993	7317.0	870.0	99.8	83.4	96.4	80.0	96.0	79.4	8459	96.6
1994	6737.0	863.0	90.7	83.8	90.0	80.5	89.1	79.9	8018	91.5
1995	5442.0	882.0	72.9	83.2	70.0	80.0	70.4	79.5	6488	74.1
1996	7210.7	931.0	88.4	83.5	88.2	80.4	88.2	79.9	7823	89.1
1997	7942.6	962.0	95.5	84.1	94.3	81.1	94.3	80.6	8385	95.7
1998	7264.0	962.0	87.4	84.2	86.3	81.3	86.2	80.9	7777	88.8
1999	7272.0	962.0	86.9	84.4	85.5	81.5	86.3	81.1	7905	90.2
2000	8457.0	962.0	99.3	85.0	99.3	82.3	100.1	81.9	8782	100.0
2001	6969.0	962.0	91.2	85.3	82.5	82.3	82.7	82.0	7481	85.4
2002	7047.2	962.0	86.0	85.3	83.9	82.4	83.6	82.0	7631	87.1
2003	7990.4	962.0	95.5	85.7	95.1	82.9	94.8	82.5	8552	97.6
2004	7106.5	962.0	84.5	85.6	84.5	82.9	84.1	82.6	7456	84.9
2005	6811.0	962.0	82.7	85.5	80.2	82.8	80.8	82.5	7403	84.5
2006	8186.9	962.0	98.8	86.0	98.8	83.4	97.1	83.0	8693	99.2
2007	7055.9	962.0	85.6	86.0	85.1	83.4	83.7	83.0	7627	87.1
2008	7264.5	962.0	86.5	86.0	85.2	83.5	86.2	83.1	7650	87.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		149			108	
C. Inspection, maintenance or repair combined with refuelling	1057			828		
D. Inspection, maintenance or repair without refuelling				12		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						8
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					4	84
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.			24			1
Z. Others					1	
Subtotal	1057	149	24	840	113	93
Total	1230			1046		

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	8	9
14. Safety Systems		10
15. Reactor Cooling System		31
16. Steam generation system	8	15
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System	87	10
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator System		2
42. Electrical Power Supply System	44	12
XX. Miscellaneous Systems		0
Total	147	103

## BE-6 TIHANGE-2

**Operator:** ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1008.0 MW(e)  
**Design Net Capacity:** 902.0 MW(e)  
**Design Discharge Burnup:** 45000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 7129.3 GW(e).h  
**Energy Availability Factor:** 80.4%  
**Load Factor:** 80.5%  
**Operating Factor:** 81.6%  
**Energy Unavailability Factor:** 19.6%  
**Total Off-line Time:** 1620 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	721.0	211.7	0.0	290.5	743.5	719.7	722.7	741.5	730.2	756.7	733.7	758.2	7129.3
<b>EAF (%)</b>	96.2	30.2	0.1	39.9	100.0	100.0	96.6	99.5	100.0	100.0	100.0	100.0	80.4
<b>UCF (%)</b>	100.0	34.0	0.1	49.9	100.0	100.0	96.9	100.0	100.0	100.0	100.0	100.0	81.9
<b>LF (%)</b>	96.1	30.2	0.0	40.0	99.1	99.2	96.4	98.9	100.6	100.8	101.1	101.1	80.5
<b>OF (%)</b>	100.0	34.9	0.0	42.9	100.0	100.0	98.4	100.0	100.0	100.0	100.0	100.0	81.6
<b>EUF (%)</b>	3.8	69.8	99.9	60.1	0.0	0.0	3.4	0.5	0.0	0.0	0.0	0.0	19.6
<b>PUF (%)</b>	0.0	66.0	99.9	29.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1
<b>UCLF (%)</b>	0.0	0.0	0.0	20.4	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.0	1.9
<b>XUF (%)</b>	3.8	3.9	0.0	10.0	0.0	0.0	0.3	0.5	0.0	0.0	0.0	0.0	1.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

SCRAM 18/04/08 REACTOR CRITICAL BUT TURBINE NOT COUPLED ON THE GRID. NO LOSS OF ENERGY GENERATED. SCRAM 18/07/08.



## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Apr 1976	<b>Lifetime Generation:</b>	186403.0 GW(e).h
<b>Date of First Criticality:</b>	05 Oct 1982	<b>Cumulative Energy Availability Factor:</b>	87.5%
<b>Date of Grid Connection:</b>	13 Oct 1982	<b>Cumulative Load Factor:</b>	87.2%
<b>Date of Commercial Operation:</b>	01 Jun 1983	<b>Cumulative Unit Capability Factor:</b>	88.7%
		<b>Cumulative Energy Unavailability Factor:</b>	12.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	4022.0	901.0	86.9	86.9	86.9	86.9	86.9	86.9	4612	89.8
1984	6856.0	901.0	86.4	86.6	86.4	86.6	86.6	86.7	7693	87.6
1985	6636.0	900.0	89.4	87.7	87.8	87.0	84.2	85.7	7890	90.1
1986	6189.0	900.0	85.0	86.9	83.1	85.9	78.5	83.7	7509	85.7
1987	6584.0	900.0	84.3	86.3	83.4	85.4	83.5	83.7	7477	85.4
1988	6966.0	900.0	89.9	87.0	87.9	85.8	88.1	84.5	7992	91.0
1989	6663.0	901.0	86.0	86.8	84.7	85.7	84.4	84.5	7728	88.2
1990	6919.0	901.0	88.5	87.1	88.0	86.0	87.7	84.9	7827	89.3
1991	6850.0	901.0	88.4	87.2	87.7	86.2	86.8	85.1	7790	88.9
1992	6746.0	901.0	89.7	87.5	86.9	86.3	85.2	85.1	7912	90.1
1993	6555.0	901.0	86.4	87.4	83.6	86.0	83.1	84.9	7507	85.7
1994	7585.0	894.0	98.3	88.3	96.7	86.9	96.9	85.9	8501	97.0
1995	6849.0	921.0	90.2	88.5	85.0	86.8	84.9	85.9	7697	87.9
1996	7253.0	943.0	88.6	88.5	87.0	86.8	87.5	86.0	7810	88.9
1997	6854.0	960.0	82.3	88.0	81.3	86.4	81.5	85.7	7241	82.7
1998	7664.0	960.0	91.0	88.2	90.6	86.7	91.1	86.0	8015	91.5
1999	8111.0	960.0	95.5	88.7	95.5	87.2	96.4	86.7	8380	95.7
2000	7481.0	960.0	89.4	88.7	88.0	87.3	88.7	86.8	7901	89.9
2001	6976.0	960.0	80.8	88.3	80.7	86.9	83.0	86.6	7137	81.5
2002	7833.4	1008.0	89.0	88.3	87.9	87.0	88.7	86.7	7821	89.3
2003	7601.0	1008.0	86.3	88.2	85.6	86.9	86.1	86.7	7589	86.6
2004	8517.3	1008.0	96.4	88.6	96.0	87.3	96.2	87.2	8478	96.5
2005	7890.0	1008.0	90.1	88.7	89.5	87.4	89.4	87.3	7929	90.5
2006	7219.3	1008.0	83.0	88.4	82.4	87.2	81.8	87.0	7348	83.9
2007	8751.6	1008.0	100.0	88.9	99.9	87.8	99.1	87.5	8760	100.0
2008	7129.3	1008.0	81.9	88.7	80.4	87.5	80.5	87.2	7165	81.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		177			115	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	1387			693	5	
D. Inspection, maintenance or repair without refuelling				89		
E. Testing of plant systems or component					2	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						15
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				14	27	
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			
Subtotal	1387	177	72	796	163	15
Total	1636			974		

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems	31	6
14. Safety Systems		2
15. Reactor Cooling System		15
16. Steam generation system		28
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		11
33. Circulating Water System	146	
41. Main Generator System		1
42. Electrical Power Supply System		15
Total	177	94

## BE-8 TIHANGE-3

Operator: ELECTRAB (ELECTRABEL M. V. NUCLEAIRE PRODUKTIE)

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

### 1. Station Details

Type: PWR

Net Reference Unit Power  
at the beginning of 2008: 1015.0 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 2008

Net Energy Production: 8385.3 GW(e).h

Energy Availability Factor: 93.9%

Load Factor: 94.0%

Operating Factor: 95.2%

Energy Unavailability Factor: 6.1%

Total Off-line Time: 420 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	307.2	707.4	690.9	730.9	750.6	726.1	744.8	743.8	728.5	759.6	735.1	760.3	8385.3
EAF (%)	40.5	100.0	91.6	100.0	99.4	99.4	98.6	98.5	99.7	100.0	100.0	100.0	93.9
UCF (%)	40.6	100.0	91.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.3
LF (%)	40.7	100.1	91.5	100.0	99.4	99.4	98.6	98.5	99.7	100.5	100.6	100.7	94.0
OF (%)	43.7	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.2
EUf (%)	59.5	0.0	8.4	0.0	0.6	0.6	1.4	1.5	0.3	0.0	0.0	0.0	6.1
PUf (%)	59.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
UCLF (%)	0.0	0.0	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
XUF (%)	0.1	0.0	0.0	0.0	0.6	0.6	1.4	1.5	0.3	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

STOP IN JANUARY TO CONTROL FUEL ASSEMBLIES.

### 5. Historical Summary

Date of Construction Start: 01 Nov 1978      Lifetime Generation: 182920.0 GW(e).h

Date of First Criticality: 05 Jun 1985      Cumulative Energy Availability Factor: 87.8%

Date of Grid Connection: 15 Jun 1985      Cumulative Load Factor: 87.5%

Date of Commercial Operation: 01 Sep 1985      Cumulative Unit Capability Factor: 89.5%

   Cumulative Energy Unavailability Factor: 12.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	Data not provided									
1986	7558.0	1020.0	86.5	86.5	85.6	85.6	84.6	84.6	7733	88.3
1987	7829.0	1020.0	89.0	87.8	87.3	86.4	87.6	86.1	7872	89.9
1988	7623.0	1020.0	87.4	87.6	85.0	86.0	85.1	85.8	7773	88.5
1989	7749.0	1020.0	87.5	87.6	87.0	86.2	86.7	86.0	7790	88.9
1990	7794.0	1020.0	90.0	88.1	87.1	86.4	87.2	86.2	7924	90.5
1991	7649.0	1020.0	88.3	88.1	86.2	86.4	85.6	86.1	7903	90.2
1992	8335.0	1020.0	93.4	88.9	93.3	87.4	93.0	87.1	8246	93.9
1993	7748.0	1020.0	89.5	88.9	88.1	87.4	86.7	87.1	7874	89.9
1994	7480.0	1015.0	86.8	88.7	84.7	87.1	84.1	86.7	7666	87.5
1995	7559.0	1015.0	86.7	88.5	84.7	86.9	85.0	86.6	7632	87.1
1996	7189.0	1015.0	81.1	87.8	81.1	86.4	80.6	86.0	7142	81.3
1997	8357.0	1015.0	99.2	88.8	94.4	87.0	94.0	86.7	8342	95.2
1998	6738.0	1015.0	77.9	87.9	75.9	86.2	75.8	85.9	6903	78.8
1999	8799.0	1015.0	99.1	88.7	98.9	87.1	99.0	86.8	8686	99.2
2000	7597.0	1015.0	86.4	88.6	84.9	86.9	85.2	86.7	7656	87.2
2001	7729.0	1015.0	89.9	88.7	86.5	86.9	86.9	86.7	7929	90.5
2002	8340.5	1015.0	95.7	89.1	93.7	87.3	93.8	87.1	8368	95.5
2003	7661.5	1015.0	89.4	89.1	86.5	87.3	86.2	87.1	7846	89.6
2004	7936.4	1015.0	90.4	89.2	89.2	87.4	89.0	87.2	7969	90.7
2005	8707.5	1015.0	99.8	89.7	99.6	88.0	97.9	87.7	8753	99.9
2006	7237.6	1015.0	86.1	89.5	83.3	87.8	81.4	87.4	7592	86.7
2007	7339.4	1015.0	83.4	89.2	83.0	87.5	82.5	87.2	7406	84.5
2008	8385.3	1015.0	94.3	89.5	93.9	87.8	94.0	87.5	8365	95.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					133	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling				657		
D. Inspection, maintenance or repair without refuelling	418			16		
E. Testing of plant systems or component				1		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				23		16
H. Nuclear regulatory requirement					2	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				6		
L. Human factor related					0	
Subtotal	418	0	0	703	139	16
Total	418			858		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		6
15. Reactor Cooling System		27
16. Steam generation system		46
31. Turbine and auxiliaries		34
32. Feedwater and Main Steam System		2
33. Circulating Water System		9
41. Main Generator System		2
42. Electrical Power Supply System		5
Total	0	131

## BR-1 ANGRA-1

**Operator:** ELETRONU (ELETROBRAS TERMONUCLEAR SA - ELETRONUCLEAR)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 491.0 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 2008

**Net Energy Production:** 3314.5 GW(e).h  
**Energy Availability Factor:** 78.5%  
**Load Factor:** 77.1%  
**Operating Factor:** 79.5%  
**Energy Unavailability Factor:** 21.5%  
**Total Off-line Time:** 1793 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	327.8	174.4	0.0	127.5	215.4	352.6	364.7	364.8	353.2	344.7	324.1	365.3	3314.5
<b>EAF (%)</b>	93.5	50.0	0.0	44.2	64.2	100.0	100.0	99.8	100.0	94.5	94.1	100.0	78.5
<b>UCF (%)</b>	93.5	50.0	0.0	44.2	64.3	100.0	100.0	99.8	100.0	94.5	94.1	100.0	78.5
<b>LF (%)</b>	89.7	52.9	0.0	36.1	59.0	99.7	99.8	99.9	99.9	94.2	91.7	100.0	77.1
<b>OF (%)</b>	94.4	53.6	0.0	44.4	64.2	100.0	100.0	100.0	100.0	99.9	96.1	100.0	79.5
<b>EUf (%)</b>	6.5	50.0	100.0	55.8	35.8	0.0	0.0	0.2	0.0	5.5	5.9	0.0	21.5
<b>PUf (%)</b>	0.1	50.0	100.0	50.2	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	16.5
<b>UCLF (%)</b>	6.5	0.0	0.0	5.6	35.8	0.0	0.0	0.0	0.0	5.5	5.8	0.0	5.0
<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. 2008 Summary of Operation

REFLECTING SG DEGRADATION THE RUP WAS CHANGED TO 491 MWE (520 MWE IS THE GROSS CAPACITY) FOR 80% POWER. THIS IS A TEMPORARY MODIFICATION AND THE UNIT WILL RETURN TO 657MWE (GROSS) AND 626MWE (NET) AS SOON AS THE STEAM GENERATORS WILL BE REPLACED (IN 2009). IN 2008, ANGRA 1 REMAINED SYNCHRONIZED TO THE SYSTEM PER 294 DAYS. IN 2008, ANGRA 1 COMPLETED 27 YEARS OF ITS FIRST CRITICALIDADE AND ITS FIRST SYNCHRONISM TO THE NATIONAL GRID, AND SURPASSED THE PRODUCTION OF LAST THE 2 YEARS, WITH 3.515.485, 9 MWH OF GROSS GENERATION, EVEN OPERATING DURING ALL THE YEAR WITH THE LIMITATION OF 80% OF ITS MAXIMUM POWER AND THE EXTENSIVE PROGRAM OF MAINTENANCE FOR OCCASION OF THE SCHEDULED OUTAGE, NECESSARY FOR THE PRESERVATION OF THE STEAM GENERATORS. THE OUTAGE 1P15A WAS PLANNED AND CARRIED THROUGH IN 60 DAYS, INITIATING AT 00H00MIN OF DAY 16/02/2008 AND FINISHED AT 00H40MIN OF DAY 16/04/2008. THE PREPARATORY ACTIVITIES FOR THE STEAM GENERATORS REPLACEMENT INCLUDED TESTS, INSPECTIONS AND REPAIRS IN THE PIPES OF THE STEAM GENERATORS.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1971	<b>Lifetime Generation:</b>	58131.5 GW(e).h
<b>Date of First Criticality:</b>	13 Mar 1982	<b>Cumulative Energy Availability Factor:</b>	53.3%
<b>Date of Grid Connection:</b>	01 Apr 1982	<b>Cumulative Load Factor:</b>	43.4%
<b>Date of Commercial Operation:</b>	01 Jan 1985	<b>Cumulative Unit Capability Factor:</b>	60.6%
		<b>Cumulative Energy Unavailability Factor:</b>	46.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	3169.4	626.0	57.8	57.8	57.8	57.8	57.8	57.8	6847	78.2
1986	132.4	626.0	3.7	30.7	3.7	30.7	2.4	30.1	512	5.8
1987	910.6	626.0	19.7	27.1	19.7	27.1	16.6	25.6	1958	22.4
1988	566.6	626.0	18.5	24.9	18.5	24.9	10.3	21.8	1488	16.9
1989	1695.1	626.0	61.8	32.3	61.3	32.2	30.9	23.6	5362	61.2
1990	2055.3	626.0	86.1	41.3	82.5	40.6	37.5	25.9	7400	84.5
1991	1306.4	626.0	57.2	43.5	57.2	43.0	23.8	25.6	5046	57.6
1992	1506.4	626.0	47.9	44.1	47.9	43.6	27.4	25.8	4275	48.7
1993	402.7	626.0	17.2	41.1	17.2	40.6	7.3	23.8	1524	17.4
1994	41.5	626.0	83.8	45.4	3.5	36.9	0.8	21.5	305	3.5
1995	2333.6	626.0	92.8	49.7	42.6	37.4	42.6	23.4	8127	92.8
1996	2288.8	626.0	67.0	51.1	55.2	38.9	41.6	24.9	5063	57.6
1997	2990.0	626.0	60.7	51.9	53.2	40.0	54.5	27.2	6219	71.0
1998	3093.8	626.0	56.4	52.2	56.4	41.2	56.4	29.3	6976	79.6
1999	3631.7	626.0	65.2	53.0	64.8	42.8	66.2	31.7	8429	96.2
2000	3164.9	626.0	58.7	53.4	58.7	43.8	57.6	33.4	6514	74.2
2001	3614.4	626.0	82.9	55.1	82.9	46.1	65.9	35.3	7295	83.3
2002	3775.2	626.0	87.7	56.9	85.9	48.3	68.8	37.1	7595	86.7
2003	3137.1	626.0	74.5	57.9	57.2	48.7	57.2	38.2	6551	74.8
2004	3890.2	626.0	70.7	58.5	70.7	49.8	70.7	39.8	7968	90.7
2005	3520.4	626.0	83.0	59.7	83.0	51.4	64.2	41.0	7275	83.0
2006	3205.2	626.0	64.0	59.9	64.0	52.0	58.4	41.8	6743	77.0
2007	2553.5	520.0	62.8	60.0	62.8	52.4	56.1	42.3	5481	62.6
2008	3314.5	491.0	78.5	60.6	78.5	53.3	77.1	43.4	6967	79.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		376			1486	0
B. Refuelling without a maintenance				38	5	
C. Inspection, maintenance or repair combined with refuelling	1440			996		
D. Inspection, maintenance or repair without refuelling				239	11	
E. Testing of plant systems or component				69	0	
H. Nuclear regulatory requirement				54	0	10
J. Grid limitation, failure or grid unavailability					5	3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					25	11
L. Human factor related					0	305
Subtotal	1440	376	0	1396	1532	329
Total		1816			3257	

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		51
13. Reactor Auxiliary Systems		93
15. Reactor Cooling System	299	5
16. Steam generation system		41
21. Fuel Handling and Storage Facilities		320
31. Turbine and auxiliaries	69	113
32. Feedwater and Main Steam System	7	55
33. Circulating Water System		7
41. Main Generator System		491
42. Electrical Power Supply System		253
Total	375	1429

**BR-2 ANGRA-2****Operator:** ELETRONUC (ELETROBRAS TERMONUCLEAR SA - ELETRONUCLEAR)**Contractor:** KWU (SIEMENS KRAFTWERK UNION AG)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power at the beginning of 2008:** 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 2008**

**Net Energy Production:** 9894.0 GW(e).h

**Energy Availability Factor:** 89.1%

**Load Factor:** 88.6%

**Operating Factor:** 90.5%

**Energy Unavailability Factor:** 10.9%

**Total Off-line Time:** 836 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	901.5	884.8	942.7	900.4	476.3	183.1	945.6	929.4	919.7	944.1	919.1	947.2	9894.0
<b>EAF (%)</b>	98.0	100.0	100.0	100.0	50.2	23.3	100.0	98.6	100.0	99.5	100.0	99.5	89.1
<b>UCF (%)</b>	98.0	100.0	100.0	100.0	61.3	23.3	100.0	98.6	100.0	99.5	100.0	99.5	90.0
<b>LF (%)</b>	95.0	103.3	99.4	98.2	50.2	19.9	99.7	98.0	100.2	99.4	100.1	99.9	88.6
<b>OF (%)</b>	98.3	103.6	100.0	100.1	61.3	23.3	100.0	99.1	100.0	99.9	100.0	100.0	90.5
<b>EUF (%)</b>	2.0	0.0	0.0	0.0	49.8	76.7	0.0	1.4	0.0	0.5	0.0	0.5	10.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	38.7	46.7	0.0	0.0	0.0	0.0	0.0	0.0	7.1
<b>UCLF (%)</b>	2.0	0.0	0.0	0.0	0.0	30.0	0.0	1.4	0.0	0.5	0.0	0.5	2.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

**4. 2008 Summary of Operation**

IN APRIL BEGAN OPERATING IN FUEL STRETCH OUT MODE. IN MAY BEGAN REFUELING OUTAGE 2P6. IN JUNE UNPLANNED OUTAGE EXTENSION (216H). IN AUGUST UNPLANNED LOSSE ENERGY DUE AUTOMATIC SCRAM DUE TO FAULT MAIN STEAM VALVE AND MANUAL SHUTDOWN DUE TO FAULT THE TURBINE CONTROL. IN OCTOBER CIRCULATING WATER PUMP HIGH VIBRATION WE CHANGE THE MOTOR. IN DECEMBER CIRCULATING WATER PUMP HIGH VIBRATION WE CHANGE THE MOTOR.

**5. Historical Summary**

**Date of Construction Start:** 01 Jan 1976 **Lifetime Generation:** 72349.1 GW(e).h

**Date of First Criticality:** 14 Jul 2000 **Cumulative Energy Availability Factor:** 82.6%

**Date of Grid Connection:** 21 Jul 2000 **Cumulative Load Factor:** 77.8%

**Date of Commercial Operation:** 01 Feb 2001 **Cumulative Unit Capability Factor:** 84.8%

**Cumulative Energy Unavailability Factor:** 17.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2001	9272.9	1350.0	94.3	94.3	94.2	94.2	85.7	85.7	7797	97.3
2002	9238.2	1275.0	91.3	92.8	83.3	88.7	82.7	84.2	8060	92.0
2003	9419.0	1275.0	91.0	92.2	84.3	87.2	84.3	84.2	8019	91.5
2004	6919.8	1275.0	72.8	87.3	72.8	83.6	61.8	78.6	6497	74.0
2005	5676.7	1275.0	63.7	82.5	63.7	79.6	50.8	73.0	5581	63.7
2006	9778.3	1275.0	89.3	83.7	89.3	81.2	87.5	75.4	8014	91.5
2007	9096.9	1275.0	85.9	84.0	84.7	81.7	81.4	76.3	7606	86.8
2008	9894.0	1275.0	90.0	84.8	89.1	82.6	88.6	77.8	7924	90.5



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2000 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		240			285	
C. Inspection, maintenance or repair combined with refuelling	624			403	58	
D. Inspection, maintenance or repair without refuelling				365		
E. Testing of plant systems or component:				6		
J. Grid limitation, failure or grid unavailability						3
Subtotal	624	240	0	774	343	3
Total		864			1120	

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

System	2008 Hours Lost	2000 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		69
15. Reactor Cooling System:	16	34
16. Steam generation system:		0
31. Turbine and auxiliaries:	8	9
32. Feedwater and Main Steam System		2
41. Main Generator System:	216	86
42. Electrical Power Supply System:		83
Total	240	283

## BG-5 KOZLODUY-5

Operator: KOZNPP (KOZLODUY NPP-plc)

Contractor: AEE (ATOMENERGOEXPORT)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 953.0 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 2008

Net Energy Production: 7341.3 GW(e).h  
 Energy Availability Factor: 87.8%  
 Load Factor: 87.9%  
 Operating Factor: 89.0%  
 Energy Unavailability Factor: 12.2%  
 Total Off-line Time: 964 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	717.7	672.2	716.2	663.1	639.4	141.2	287.7	704.4	675.4	715.1	691.1	718.0	7341.3
EAF (%)	99.6	99.6	99.5	98.7	98.7	20.6	40.6	99.3	98.4	99.5	99.7	99.7	87.8
UCF (%)	100.0	100.0	99.8	99.0	100.0	22.0	40.8	99.8	99.7	99.9	100.0	100.0	88.4
LF (%)	101.2	105.0	101.0	96.8	90.2	20.6	40.6	99.3	98.4	100.7	100.7	101.3	87.9
OF (%)	100.0	103.6	100.0	100.1	100.0	22.4	42.3	100.0	100.0	99.9	100.0	100.0	89.0
EUF (%)	0.4	0.4	0.5	1.3	1.3	79.4	59.4	0.7	1.6	0.5	0.3	0.3	12.2
PUF (%)	0.0	0.0	0.0	0.0	0.0	78.0	59.2	0.2	0.0	0.1	0.0	0.0	11.5
UCLF (%)	0.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.1
XUF (%)	0.4	0.4	0.3	0.3	1.3	1.4	0.2	0.4	1.3	0.3	0.3	0.3	0.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THE UNIT 5 WAS OPERATED IN ACCORDANCE WITH THE AGREED BY GRID OPERATOR LOAD SCHEDULE: ON BASE LOAD MODE DURING THE PERIOD JANUARY –APRIL; SEPTEMBER-DECEMBER; AND AT LOWER POWER (80-85) IN APRIL AND MAY. IN THE PERIOD FROM 27TH MAY-7TH JUNE THE UNIT 5 WAS OPERATED ON FUEL COAST-DOWN MODE.THE ANNUAL MAINTENANCE AND REFUELING WAS PERFORMED FOR 41 DAYS.DUE TO KNPP SITE SPECIFICITY UNIT 5 IS PROVIDED THE STEAM AND ELECTRICITY SUPPLY OF THE UNIT 6 DURING ITS OUTAGES, AND IT IS PROVIDED A PARTIAL ELECTRICITY SUPPLY OF THE SHUT-DOWN UNITS 1-4.IN 2008 THERE ARE NO UNPLANNED TG OR REACTOR TRIPS DURING THE UNIT 5 OPERATION.IN 2008 WAS REGISTERED THE BIGGEST ELECTRICITY GENERATION DURING THE ALL UNIT 5 OPERATIONAL HISTORY AND VERY HIGH LEVEL OF THE OPERATIONAL SAFETY AND RELIABILITY.

## 5. Historical Summary

<b>Date of Construction Start:</b>	09 Jul 1980	<b>Lifetime Generation:</b>	90497.0 GW(e).h
<b>Date of First Criticality:</b>	05 Nov 1987	<b>Cumulative Energy Availability Factor:</b>	63.8%
<b>Date of Grid Connection:</b>	29 Nov 1987	<b>Cumulative Load Factor:</b>	53.8%
<b>Date of Commercial Operation:</b>	23 Dec 1988	<b>Cumulative Unit Capability Factor:</b>	66.9%
		<b>Cumulative Energy Unavailability Factor:</b>	36.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	635.9	887.0	100.0	100.0	100.0	100.0	96.4	96.4	744	100.0
1989	3355.1	953.0	51.5	55.1	51.5	55.1	40.2	44.3	4663	53.2
1990	3380.9	953.0	58.1	56.5	41.8	48.7	40.5	42.5	5592	63.8
1991	1950.4	953.0	31.7	48.5	31.7	43.2	23.4	36.3	2777	31.7
1992	3540.7	953.0	56.7	50.5	47.0	44.1	42.3	37.7	4982	56.7
1993	3278.0	953.0	50.5	50.5	47.5	44.8	39.3	38.0	4675	53.4
1994	2880.4	953.0	52.6	50.8	48.1	45.3	34.5	37.5	4350	49.7
1995	4699.3	953.0	68.1	53.3	59.4	47.3	56.3	40.1	5988	68.4
1996	4720.3	953.0	73.8	55.8	73.8	50.6	56.4	42.1	6468	73.6
1997	4410.2	953.0	68.7	57.2	68.7	52.6	52.8	43.3	6034	68.9
1998	3741.0	953.0	73.3	58.8	73.3	54.6	44.8	43.5	6467	73.8
1999	3423.2	953.0	54.8	58.5	50.4	54.3	41.0	43.2	4838	55.2
2000	4340.8	1000.0	63.5	58.9	54.4	54.3	49.4	43.8	5406	61.5
2001	5049.6	953.0	66.6	59.5	61.5	54.8	60.5	45.0	5940	67.8
2002	5095.8	953.0	79.8	60.9	79.4	56.6	61.0	46.2	7003	79.9
2003	5596.7	953.0	98.6	63.4	98.6	59.3	67.0	47.6	8579	97.9
2004	4842.0	953.0	67.2	63.7	67.2	59.8	57.8	48.2	5906	67.2
2005	5513.5	953.0	75.2	64.3	75.2	60.7	66.0	49.2	6641	75.8
2006	6047.0	953.0	75.8	65.0	75.7	61.6	72.4	50.5	6691	76.4
2007	6669.9	953.0	80.4	65.8	80.2	62.5	79.9	52.1	7090	80.9
2008	7341.3	953.0	88.4	66.9	87.8	63.8	87.9	53.8	7796	89.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					182	
B. Refuelling without a maintenance outage					2	
C. Inspection, maintenance or repair combined with refuelling	989			1638		
D. Inspection, maintenance or repair without refuelling				208		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				116		
H. Nuclear regulatory requirement				29		
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Subtotal	989	0	0	1991	184	2
Total	989			2177		

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		10
13. Reactor Auxiliary System:		0
15. Reactor Cooling System:		9
16. Steam generation system:		11
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries:		17
32. Feedwater and Main Steam System		17
35. All other I&C Systems:		2
41. Main Generator System:		107
42. Electrical Power Supply System:		2
Total	0	177

## BG-6 KOZLODUY-6

Operator: KOZNPP (KOZLODUY NPP-plc)

Contractor: AEE (ATOMENERGOEXPORT)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 953.0 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 2008

Net Energy Production: 7400.2 GW(e).h  
 Energy Availability Factor: 87.2%  
 Load Factor: 88.6%  
 Operating Factor: 88.5%  
 Energy Unavailability Factor: 12.8%  
 Total Off-line Time: 1007 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	719.6	673.8	719.2	698.4	712.7	681.3	704.4	455.3	0.0	615.7	698.9	721.0	7400.2
EAF (%)	99.6	99.6	99.7	99.7	99.7	99.3	99.4	64.2	0.0	85.6	99.7	99.7	87.2
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	70.9	0.0	85.9	100.0	100.0	88.1
LF (%)	101.5	105.2	101.4	101.9	100.5	99.3	99.4	64.2	0.0	86.7	101.9	101.7	88.6
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	71.1	0.0	87.0	100.0	100.0	88.5
EUf (%)	0.4	0.4	0.3	0.3	0.3	0.7	0.6	35.8	100.0	14.4	0.3	0.3	12.8
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.1	100.0	14.1	0.0	0.0	11.9
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 (%)	0.4	0.4	0.3	0.3	0.3	0.7	0.6	6.7	0.0	0.3	0.3	0.3	0.9

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THE UNIT 6 WAS OPERATED IN ACCORDANCE WITH THE AGREED BY GRID OPERATOR LOAD SCHEDULE: ON BASE LOAD MODE DURING THE PERIOD JANUARY –JULY AND OCTOBER-DECEMBER. IN AUGUST THE UNIT 6 WAS OPERATED ON FUEL COAST-DOWN MODE.THE ANNUAL MAINTENANCE AND REFUELING WAS PERFORMED FOR 43 DAYS. WITHIN THE PLANNED OUTAGE WAS PERFORMED AN IMPORTANT MODERNIZATION PROJECT – REPLACEMENT OF A SAFETY CONTROL SYSTEM (ONE TRAIN). DUE TO KNPP SITE SPECIFICITY UNIT 6 IS PROVIDED THE STEAM AND ELECTRICITY SUPPLY OF THE UNIT 5 DURING ITS OUTAGES, AND IT IS PROVIDED A PARTIAL ELECTRICITY SUPPLY OF THE SHUT-DOWN UNITS 1-4.IN 2008 THERE ARE NO UNPLANNED TG OR REACTOR TRIPS DURING THE UNIT 6 OPERATION.IN 2008 WAS REGISTERED 12 YEARS OPERATION WITHOUT REACTOR SCRAM, THE BIGGEST ELECTRICITY GENERATION DURING THE ALL UNIT 6 OPERATIONAL HISTORY AND VERY HIGH LEVEL OF THE OPERATIONAL SAFETY AND RELIABILITY.

### 5. Historical Summary

Date of Construction Start: 01 Apr 1982      Lifetime Generation: 78278.0 GW(e).h  
 Date of First Criticality: 29 May 1991      Cumulative Energy Availability Factor: 71.5%  
 Date of Grid Connection: 02 Aug 1991      Cumulative Load Factor: 61.9%  
 Date of Commercial Operation: 30 Dec 1993      Cumulative Unit Capability Factor: 74.2%  
    Cumulative Energy Unavailability Factor: 28.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1993	59.9	953.0	91.2	91.2	91.2	91.2	8.4	8.4	678	91.1
1994	4862.6	953.0	88.7	88.9	87.6	87.9	58.2	54.3	7817	89.2
1995	3831.9	953.0	63.6	76.8	63.6	76.2	45.9	50.3	5568	63.6
1996	5495.9	953.0	76.2	76.6	76.2	76.2	65.7	55.3	6698	76.3
1997	4825.4	953.0	72.8	75.7	72.8	75.4	57.8	55.9	6380	72.8
1998	3970.0	953.0	63.7	73.3	63.7	73.1	47.6	54.3	6079	69.4
1999	4407.8	953.0	69.6	72.7	60.7	71.1	52.8	54.0	6194	70.7
2000	4064.3	1000.0	66.8	71.8	51.2	68.1	46.3	52.9	5772	65.7
2001	4189.4	953.0	63.4	70.8	50.4	66.0	50.2	52.5	5441	62.1
2002	5324.9	953.0	71.5	70.9	71.5	66.6	63.8	53.8	6256	71.4
2003	5480.6	953.0	72.9	71.1	72.9	67.2	65.6	54.9	6474	73.9
2004	5298.1	953.0	75.3	71.4	75.2	67.9	63.3	55.7	6614	75.3
2005	6150.0	953.0	77.0	71.9	76.9	68.7	73.7	57.2	6772	77.3
2006	5917.3	953.0	77.1	72.3	77.0	69.3	70.9	58.2	6821	77.9
2007	7024.8	953.0	85.0	73.2	84.7	70.4	84.1	60.1	7493	85.5
2008	7400.2	953.0	88.1	74.2	87.2	71.5	88.6	61.9	7753	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1992 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure	1030			1511	196	
C. Inspection, maintenance or repair combined with refuelling						
D. Inspection, maintenance or repair without refuelling				133		
E. Testing of plant systems or component				10	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				127		
J. Grid limitation, failure or grid unavailability						
Subtotal	1030	0	0	1781	196	4
Total	1030			1981		

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

System	2008 Hours Lost	1992 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		5
14. Safety Systems		30
32. Feedwater and Main Steam System		2
41. Main Generator System		9
42. Electrical Power Supply System		148
Total	0	194

## CA-10 BRUCE-3

**Operator:** BRUCEPOW (BRUCE POWER)

**Contractor:** NEI.P (NEI PARSONS)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 734.0 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 2008

**Net Energy Production:** 5148.9 GW(e).h  
**Energy Availability Factor:** 79.3%  
**Load Factor:** 80.1%  
**Operating Factor:** 81.3%  
**Energy Unavailability Factor:** 20.7%  
**Total Off-line Time:** 1635 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	550.4	513.8	548.1	534.0	553.0	527.9	538.7	484.0	256.8	0.0	170.9	471.4	5148.9
<b>EAF (%)</b>	99.9	99.8	99.6	99.9	100.0	99.5	98.0	88.7	48.6	0.1	32.4	85.4	79.3
<b>UCF (%)</b>	99.9	99.8	99.6	99.9	100.0	100.0	99.8	90.6	49.8	0.1	32.6	85.4	79.7
<b>LF (%)</b>	100.8	104.2	100.4	101.2	101.3	99.9	98.6	88.6	48.6	0.0	32.3	86.3	80.1
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	93.3	49.7	0.0	43.6	87.0	81.3
<b>EUF (%)</b>	0.1	0.2	0.4	0.1	0.0	0.5	2.0	11.3	51.4	99.9	67.6	14.6	20.7
<b>PUF (%)</b>	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	50.2	99.9	57.2	0.0	17.4
<b>UCLF (%)</b>	0.0	0.0	0.3	0.0	0.0	0.0	0.1	9.4	0.0	0.0	10.2	14.6	2.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.4	1.8	1.8	1.2	0.0	0.1	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

PLANNED OUTAGE IN FALL OF 2008 INCLUDED A VERY SUCCESSFUL WESTSHIFT PROGRAM. THE PREVIOUS REFERENCE UNIT POWER OF 750 MW HAD BEEN ESTABLISHED PRIOR TO THE UNIT 3 RESTART AND NEEDED SUFFICIENT ACTUAL OUTPUT RESULTS BEFORE THIS COULD BE UPDATED. ENGINEERING ANALYSIS AND MANAGEMENT HAS ACCEPTED THAT UNIT OUTPUT WILL BE LOWER.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jul 1972	<b>Lifetime Generation:</b>	115384.6 GW(e).h
<b>Date of First Criticality:</b>	28 Nov 1977	<b>Cumulative Energy Availability Factor:</b>	73.0%
<b>Date of Grid Connection:</b>	12 Dec 1977	<b>Cumulative Load Factor:</b>	72.9%
<b>Date of Commercial Operation:</b>	01 Feb 1978	<b>Cumulative Unit Capability Factor:</b>	73.7%
		<b>Cumulative Energy Unavailability Factor:</b>	27.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	4793.0	740.0	87.6	87.6	87.6	87.6	82.0	82.0	7361	93.2
1979	4797.9	740.0	77.8	82.4	77.8	82.4	73.2	77.4	6885	77.7
1980	5939.8	740.0	91.4	85.5	91.4	85.5	91.4	82.2	8276	94.2
1981	5795.0	740.0	89.5	86.5	89.5	86.5	89.4	84.0	7873	89.9
1982	6381.9	740.0	96.7	88.6	96.7	88.6	98.4	87.0	8497	97.0
1983	6091.1	740.0	89.2	88.7	89.2	88.7	94.0	88.1	7905	90.2
1984	6148.7	740.0	91.2	89.1	91.2	89.1	94.6	89.1	8077	92.0
1985	6015.1	775.0	93.9	89.7	88.6	89.0	88.6	89.0	8118	92.7
1986	5891.2	796.0	86.9	89.4	84.2	88.4	84.5	88.5	7600	86.8
1987	6073.3	848.0	85.8	89.0	81.9	87.7	81.8	87.7	7724	88.2
1988	3310.6	848.0	45.6	84.6	45.6	83.4	44.4	83.3	4044	46.0
1989	4031.7	848.0	57.4	82.1	54.8	80.8	54.3	80.7	5364	61.2
1990	5652.7	848.0	76.8	81.6	76.3	80.4	76.1	80.3	7472	85.3
1991	6126.3	848.0	84.3	81.8	82.4	80.6	82.5	80.5	7950	90.8
1992	5801.0	848.0	77.9	81.6	77.9	80.4	77.9	80.3	7438	84.7
1993	3158.2	848.0	43.0	79.0	43.0	77.9	42.5	77.7	6557	74.9
1994	2737.6	848.0	36.9	76.3	36.9	75.3	36.9	75.2	5006	57.1
1995	4225.8	848.0	56.9	75.2	56.9	74.2	56.9	74.1	7000	79.9
1996	3321.5	848.0	44.6	73.5	44.6	72.5	44.6	72.4	5684	64.7
1997	4214.8	848.0	56.8	72.6	56.8	71.7	56.7	71.6	6325	72.2
1998	1642.5	848.0	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	750.0	76.5	72.9	76.1	72.0	75.3	71.9	7154	81.4
2005	4938.1	750.0	75.5	73.0	75.2	72.2	75.2	72.0	6782	77.4
2006	5440.2	750.0	83.3	73.4	82.9	72.6	82.8	72.5	7435	84.9
2007	4966.7	750.0	76.7	73.5	76.0	72.7	75.6	72.6	6911	78.9
2008	5148.9	734.0	79.7	73.7	79.3	73.0	80.1	72.9	7125	81.3



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		146			619	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling				25	0	
D. Inspection, maintenance or repair without refuelling	1464			596	1	
E. Testing of plant systems or component:				17	1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	15
L. Human factor related		46			2	
Subtotal	1464	192	0	638	630	15
Total		1656			1283	

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		68
12. Reactor I&C Systems		49
13. Reactor Auxiliary System:		28
14. Safety Systems		45
15. Reactor Cooling System:		64
16. Steam generation system:		121
31. Turbine and auxiliaries		109
32. Feedwater and Main Steam System		35
33. Circulating Water System	49	
35. All other I&C Systems		7
41. Main Generator System:	97	66
42. Electrical Power Supply System:		7
XX. Miscellaneous Systems		1
Total	146	600

## CA-11 BRUCE-4

**Operator:** BRUCEPOW (BRUCE POWER)

**Contractor:** NEI.P (NEI PARSONS)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 734.0 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 2008

**Net Energy Production:** 5504.4 GW(e).h  
**Energy Availability Factor:** 84.9%  
**Load Factor:** 85.4%  
**Operating Factor:** 86.6%  
**Energy Unavailability Factor:** 15.1%  
**Total Off-line Time:** 1181 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	547.8	472.4	440.0	50.0	547.5	527.6	535.4	531.2	461.7	530.1	350.5	510.2	5504.4
<b>EAF (%)</b>	99.7	91.8	80.4	9.4	99.2	99.6	97.7	97.2	87.1	96.1	66.2	92.6	84.9
<b>UCF (%)</b>	99.7	91.8	80.4	9.4	99.3	99.9	99.6	99.0	89.1	98.0	66.4	92.7	85.6
<b>LF (%)</b>	100.3	92.5	80.6	9.5	100.3	99.8	98.0	97.3	87.4	97.1	66.3	93.4	85.4
<b>OF (%)</b>	100.0	92.7	80.4	11.3	100.0	100.0	100.0	100.0	90.1	99.6	66.4	96.1	86.6
<b>EUF (%)</b>	0.3	8.2	19.6	90.6	0.8	0.4	2.3	2.8	12.9	3.9	33.8	7.4	15.1
<b>PUF (%)</b>	0.1	0.1	19.6	85.1	0.1	0.0	0.1	0.1	0.0	0.0	33.5	7.1	12.0
<b>UCLF (%)</b>	0.2	8.1	0.0	5.4	0.7	0.0	0.3	0.9	10.9	2.0	0.0	0.2	2.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.4	1.9	1.9	2.0	1.9	0.3	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

PLANNED OUTAGE IN SPRING OF 2008 INCLUDED BOILER INSPECTIONS WHICH DEMONSTRATE BETTER EQUIPMENT CONDITION THAN EXPECTED. THE PREVIOUS REFERENCE UNIT POWER OF 750 MW HAD BEEN ESTABLISHED PRIOR TO THE UNIT 3 RESTART AND NEEDED SUFFICIENT ACTUAL OUTPUT RESULTS BEFORE THIS COULD BE UPDATED. ENGINEERING ANALYSIS AND MANAGEMENT HAS ACCEPTED THAT UNIT OUTPUT WILL BE LOWER.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Sep 1972	<b>Lifetime Generation:</b>	109922.0 GW(e).h
<b>Date of First Criticality:</b>	10 Dec 1978	<b>Cumulative Energy Availability Factor:</b>	71.0%
<b>Date of Grid Connection:</b>	21 Dec 1978	<b>Cumulative Load Factor:</b>	70.6%
<b>Date of Commercial Operation:</b>	18 Jan 1979	<b>Cumulative Unit Capability Factor:</b>	71.9%
		<b>Cumulative Energy Unavailability Factor:</b>	29.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	4966.4	740.0	84.8	84.8	84.8	84.8	80.4	80.4	7084	84.8
1980	4945.1	740.0	76.1	80.4	76.1	80.4	76.1	78.2	6962	79.3
1981	5753.5	740.0	89.1	83.3	89.1	83.3	88.8	81.7	7874	89.9
1982	6050.2	740.0	92.2	85.6	92.2	85.6	93.3	84.7	8150	93.0
1983	6407.4	740.0	94.3	87.3	94.3	87.3	98.8	87.5	8345	95.3
1984	6664.6	740.0	97.8	89.1	97.8	89.1	102.5	90.1	8625	98.2
1985	4995.2	788.0	79.0	87.6	73.2	86.7	72.3	87.4	6518	74.4
1986	6891.6	848.0	95.5	88.7	92.8	87.5	92.8	88.1	8644	98.7
1987	5045.0	848.0	71.5	86.6	67.9	85.1	67.9	85.6	6366	72.7
1988	4663.7	848.0	66.9	84.4	65.7	83.0	62.6	83.1	5997	68.3
1989	5584.2	848.0	77.0	83.7	75.3	82.2	75.2	82.3	7290	83.2
1990	3533.0	848.0	48.3	80.5	47.5	79.1	47.6	79.2	4611	52.6
1991	5940.7	848.0	81.6	80.6	79.9	79.2	80.0	79.3	7955	90.8
1992	5843.4	848.0	80.1	80.6	78.4	79.1	78.4	79.2	8070	91.9
1993	350.1	848.0	4.7	75.2	4.7	73.9	4.7	73.9	527	6.0
1994	3656.0	848.0	49.3	73.5	49.3	72.2	49.2	72.3	7206	82.3
1995	3034.9	848.0	40.9	71.5	40.9	70.3	40.9	70.4	5024	57.4
1996	5296.3	848.0	71.2	71.4	71.2	70.3	71.1	70.4	8686	98.9
1997	2923.0	848.0	39.4	69.7	39.4	68.6	39.3	68.7	4968	56.7
1998	12.3	848.0	0.8	68.9	0.8	67.9	0.8	67.9	45	2.5
1999	Data not available - Long-term shutdown									
2000	"									
2001	"									
2002	"									
2003	934.5	769.0	100.0	69.3	100.0	68.3	55.0	67.8	802	36.3
2004	5418.8	769.0	83.4	69.9	83.4	69.0	82.1	68.4	7469	85.0
2005	5499.1	750.0	84.1	70.5	83.7	69.6	83.7	69.1	7469	85.3
2006	5308.2	750.0	81.6	71.0	80.8	70.1	80.8	69.6	7261	82.9
2007	5251.0	750.0	80.8	71.4	80.1	70.5	79.9	70.0	7298	83.3
2008	5504.4	734.0	85.6	71.9	84.9	71.0	85.4	70.6	7603	86.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1979 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		113			750	
B. Refuelling without a maintenance outage					4	
C. Inspection, maintenance or repair combined with refuelling				40		
D. Inspection, maintenance or repair without refuelling	1016			600		
E. Testing of plant systems or component				51		
H. Nuclear regulatory requirement		51			5	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					14	21
L. Human factor related					4	
Z. Others				0		
Subtotal	1016	164	0	691	777	21
Total		1180			1489	

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

System	2008 Hours Lost	1979 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		113
12. Reactor I&C Systems		38
14. Safety Systems		12
15. Reactor Cooling System		72
16. Steam generation system		200
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	74	50
32. Feedwater and Main Steam System		39
35. All other I&C Systems		116
41. Main Generator System		21
42. Electrical Power Supply System		27
XX. Miscellaneous Systems	39	15
Total	113	704

## 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 5597.0 GW(e).h  
 Energy Availability Factor: 78.0%  
 Load Factor: 78.0%  
 Operating Factor: 79.0%  
 Energy Unavailability Factor: 22.0%  
 Total Off-line Time: 1841 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	601.0	448.1	449.1	531.5	0.0	4.5	592.7	600.3	580.4	596.5	585.4	607.5	5597.0
EAF (%)	99.3	79.1	73.4	90.6	0.0	0.6	97.2	98.7	98.7	99.7	99.0	99.7	78.0
UCF (%)	99.3	79.1	73.4	90.6	0.0	0.6	97.9	99.9	99.8	99.7	99.0	99.7	78.3
LF (%)	98.9	78.8	73.9	90.4	0.0	0.8	97.5	98.8	98.7	98.1	99.5	99.9	78.0
OF (%)	100.0	79.0	75.0	91.7	0.0	2.1	100.0	100.0	100.0	100.0	100.0	100.0	79.0
EU (%)	0.7	20.9	26.6	9.4	100.0	99.4	2.8	1.3	1.3	0.3	1.0	0.3	22.0
PUF (%)	0.7	0.0	0.0	0.1	93.8	71.4	2.1	0.0	0.0	0.0	0.0	0.0	14.1
UCLF (%)	0.0	20.9	26.6	9.3	6.2	27.9	0.0	0.1	0.2	0.3	1.0	0.3	7.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.2	1.1	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

RELATIVELY SUCCESSFUL SPRING OUTAGE. OF NOTE WAS THE OUTAGE IN FEBRUARY AND MARCH DUE TO A FUELING MACHINE FAILURE ON THE REACTOR. UNIT 5 REFERENCE UNIT POWER ADJUSTED UP TO 817MW FOLLOWING SUCCESSFUL CORE REORDER.

### 5. Historical Summary

Date of Construction Start: 01 Jun 1978      Lifetime Generation: 143177.5 GW(e).h  
 Date of First Criticality: 15 Nov 1984      Cumulative Energy Availability Factor: 83.4%  
 Date of Grid Connection: 02 Dec 1984      Cumulative Load Factor: 83.2%  
 Date of Commercial Operation: 01 Mar 1985      Cumulative Unit Capability Factor: 84.0%  
    Cumulative Energy Unavailability Factor: 16.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	4992.2	805.0	91.6	91.6	85.9	85.9	84.2	84.2	6324	86.1
1986	7078.0	835.0	98.4	95.4	96.7	91.8	96.8	91.2	8675	99.0
1987	5730.1	835.0	80.2	90.0	78.2	87.0	78.3	86.6	7197	82.2
1988	6673.6	860.0	88.5	89.6	88.5	87.4	88.3	87.1	7824	89.1
1989	7130.8	860.0	97.1	91.2	94.1	88.8	94.7	88.7	8589	98.0
1990	5534.7	860.0	74.6	88.3	73.5	86.1	73.5	86.0	6656	76.0
1991	6769.6	860.0	90.7	88.6	90.3	86.8	89.9	86.6	8130	92.8
1992	6452.1	860.0	85.8	88.3	85.8	86.6	85.4	86.4	7636	86.9
1993	5118.3	860.0	68.1	86.0	68.1	84.5	67.9	84.3	7457	85.1
1994	5629.3	860.0	75.0	84.8	75.0	83.5	74.7	83.3	7671	87.6
1995	6125.3	860.0	81.4	84.5	81.4	83.3	81.3	83.1	7859	89.7
1996	5767.6	860.0	76.4	83.8	76.4	82.7	76.3	82.6	7153	81.4
1997	6388.3	860.0	84.8	83.9	84.8	82.9	84.8	82.7	8148	93.0
1998	5623.1	785.0	81.7	83.7	81.7	82.8	81.8	82.7	7305	83.4
1999	5281.9	785.0	76.6	83.3	76.6	82.4	76.8	82.3	6719	76.7
2000	6908.7	785.0	99.1	84.2	99.1	83.4	100.2	83.4	8719	99.3
2001	4902.1	790.0	70.9	83.5	70.9	82.7	70.8	82.7	6220	71.0
2002	5993.1	790.0	86.3	83.6	86.3	82.9	86.6	82.9	7630	87.1
2003	5302.5	790.0	77.3	83.3	77.3	82.6	76.6	82.6	6783	77.4
2004	5889.1	790.0	85.1	83.4	85.1	82.7	84.9	82.7	7543	85.9
2005	5109.6	790.0	74.6	83.0	74.1	82.3	73.8	82.3	6678	76.2
2006	6723.5	806.0	97.2	83.6	96.8	83.0	95.9	82.9	8694	99.2
2007	6710.9	795.0	97.7	84.2	97.2	83.6	96.4	83.4	8760	100.0
2008	5597.0	817.0	78.3	84.0	78.0	83.4	78.0	83.2	6943	79.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		638			265	
D. Inspection, maintenance or repair without refuelling	1202			712	9	
E. Testing of plant systems or component:				8	0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					5	17
L. Human factor related					5	
Subtotal	1202	638	0	720	284	17
Total		1840			1021	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems	106	29
13. Reactor Auxiliary System:		12
14. Safety Systems		19
15. Reactor Cooling System:		107
16. Steam generation system:	201	12
21. Fuel Handling and Storage Facilities	331	0
31. Turbine and auxiliaries:		10
32. Feedwater and Main Steam System		27
33. Circulating Water System		2
41. Main Generator System:		16
42. Electrical Power Supply System:		9
XX. Miscellaneous Systems		3
Total	638	246

## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6857.3 GW(e).h  
**Energy Availability Factor:** 95.3%  
**Load Factor:** 95.8%  
**Operating Factor:** 96.5%  
**Energy Unavailability Factor:** 4.7%  
**Total Off-line Time:** 308 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	612.4	559.0	479.4	591.6	609.7	592.0	603.1	603.8	455.9	550.4	589.8	610.1	6857.3
<b>EAF (%)</b>	100.0	98.7	78.5	100.0	100.0	100.0	99.3	99.1	78.1	91.0	99.7	99.8	95.3
<b>UCF (%)</b>	100.0	98.7	78.5	100.0	100.0	100.0	99.9	100.0	78.5	91.0	99.7	99.8	95.5
<b>LF (%)</b>	100.7	101.8	78.9	100.7	100.3	100.6	99.2	99.3	77.5	90.4	100.3	100.4	95.8
<b>OF (%)</b>	100.0	103.6	83.5	100.1	100.0	100.0	100.0	100.0	79.6	91.5	100.0	100.0	96.5
<b>EUF (%)</b>	0.0	1.3	21.5	0.0	0.0	0.0	0.7	0.9	21.9	9.0	0.3	0.2	4.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.5	0.0	0.0	0.0	1.8
<b>UCLF (%)</b>	0.0	1.3	21.5	0.0	0.0	0.0	0.1	0.0	0.0	9.0	0.3	0.2	2.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.9	0.4	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

ONE MINOR PLANNED OUTAGE AND A NUMBER OF FORCED OUTAGES PREVENTED UNIT FROM RUNNING THE FULL YEAR. REFERENCE UNIT POWER ADJUSTED BASED ON MANAGEMENT ACCEPTED ENGINEERING ANALYSIS OF TURBINE TESTING COMPLETED ON ALL UNITS FOLLOWING TURBINE UPGRADES.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1978  
**Date of First Criticality:** 29 May 1984  
**Date of Grid Connection:** 26 Jun 1984  
**Date of Commercial Operation:** 14 Sep 1984

**Lifetime Generation:** 141052.1 GW(e).h  
**Cumulative Energy Availability Factor:** 80.6%  
**Cumulative Load Factor:** 80.3%  
**Cumulative Unit Capability Factor:** 81.4%  
**Cumulative Energy Unavailability Factor:** 19.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	2301.0	822.0	99.4	99.4	98.8	98.8	98.9	98.9	2926	99.9
1985	5900.1	805.0	88.7	91.3	84.0	87.7	83.7	87.4	7369	84.1
1986	5716.0	835.0	81.7	87.1	77.8	83.4	78.1	83.4	7213	82.3
1987	7017.1	837.0	97.9	90.4	95.3	87.0	95.7	87.1	8610	98.3
1988	6139.5	837.0	89.2	90.1	89.1	87.5	83.5	86.3	7880	89.7
1989	5386.2	837.0	78.9	88.0	73.4	84.8	73.5	83.8	7069	80.7
1990	6213.6	852.0	83.9	87.3	82.3	84.4	83.2	83.7	7429	84.8
1991	7013.4	860.0	93.3	88.2	93.0	85.6	93.1	85.1	8194	93.5
1992	5328.2	860.0	70.5	86.0	70.5	83.8	70.5	83.3	6393	72.8
1993	4351.0	860.0	58.0	82.9	58.0	81.0	57.8	80.5	6950	79.3
1994	6451.7	860.0	85.7	83.2	85.7	81.4	85.6	81.0	8760	100.0
1995	4671.6	860.0	62.1	81.3	62.1	79.7	62.0	79.3	6049	69.1
1996	6822.8	860.0	90.4	82.1	90.4	80.6	90.3	80.2	8682	98.8
1997	4796.4	860.0	63.7	80.7	63.7	79.3	63.7	78.9	6201	70.8
1998	4678.6	785.0	68.1	79.9	68.0	78.6	68.0	78.2	6137	70.1
1999	6860.1	785.0	99.4	81.0	99.3	79.8	99.8	79.5	8760	100.0
2000	4668.2	785.0	66.8	80.2	66.8	79.1	67.7	78.9	5912	67.3
2001	6840.1	790.0	98.3	81.2	98.3	80.1	98.8	79.9	8624	98.4
2002	3522.5	790.0	50.6	79.6	50.6	78.6	50.9	78.4	4539	51.8
2003	6750.9	790.0	98.2	80.5	98.2	79.6	97.6	79.4	8559	97.7
2004	5379.1	790.0	76.6	80.4	76.6	79.4	75.4	79.2	6698	76.3
2005	5721.1	841.0	79.6	80.3	79.6	79.4	78.9	79.2	7151	81.6
2006	7104.4	822.0	99.4	81.2	99.3	80.3	98.7	80.0	8760	100.0
2007	5145.0	822.0	71.8	80.8	71.8	79.9	71.5	79.7	6363	72.6
2008	6857.3	817.0	95.5	81.4	95.3	80.6	95.8	80.3	8452	96.5



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		185			450	
B. Refuelling without a maintenance					4	
D. Inspection, maintenance or repair without refuelling	147			819	2	
E. Testing of plant systems or component				0	3	
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					18	17
L. Human factor related					2	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					16	
Subtotal	147	185	0	819	495	20
Total		332			1334	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		103
12. Reactor I&C Systems		49
14. Safety Systems		25
15. Reactor Cooling System:	123	109
16. Steam generation system:		81
31. Turbine and auxiliaries:		15
32. Feedwater and Main Steam System		18
33. Circulating Water System		9
41. Main Generator System:	62	1
42. Electrical Power Supply System:		28
Total	185	438

# 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 5763.7 GW(e).h  
 Energy Availability Factor: 79.9%  
 Load Factor: 80.5%  
 Operating Factor: 81.1%  
 Energy Unavailability Factor: 20.1%  
 Total Off-line Time: 1659 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	528.3	0.0	40.6	594.3	562.3	586.6	503.1	602.6	582.1	559.7	591.9	612.1	5763.7
EAF (%)	86.2	-3.6	6.6	99.7	91.7	99.5	82.9	99.0	99.5	92.1	99.9	99.3	79.9
UCF (%)	86.2	-3.6	6.6	99.7	91.8	99.7	83.4	99.7	100.0	92.1	99.9	99.4	80.0
LF (%)	86.9	0.0	6.7	101.2	92.5	99.7	82.8	99.1	99.0	92.0	100.6	100.7	80.5
OF (%)	86.8	0.0	8.6	100.1	92.6	100.0	86.3	100.0	100.0	92.9	100.0	100.0	81.1
EUUF (%)	13.8	103.6	93.4	0.3	8.3	0.5	17.1	1.0	0.5	7.9	0.1	0.7	20.1
PUF (%)	13.8	103.6	56.8	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0
UCLF (%)	0.0	0.0	36.6	0.0	8.3	0.3	16.6	0.4	0.0	7.9	0.1	0.7	6.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.2	0.6	0.6	0.5	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

PLANNED OUTAGE IN SPRING EXPERIENCE DELAYS IN RETURN TO SERVICE.REFERENCE UNIT POWER  
 ADJUSTED BASED ON MANAGEMENT ACCEPTED ENGINEERING ANALYSIS OF TURBINE TESTING COMPLETED ON  
 ALL UNITS FOLLOWING TURBINE UPGRADES.

## 5. Historical Summary

Date of Construction Start: 01 May 1979      Lifetime Generation: 136960.0 GW(e).h  
 Date of First Criticality: 07 Jan 1986      Cumulative Energy Availability Factor: 83.7%  
 Date of Grid Connection: 22 Feb 1986      Cumulative Load Factor: 83.3%  
 Date of Commercial Operation: 10 Apr 1986      Cumulative Unit Capability Factor: 84.7%  
    Cumulative Energy Unavailability Factor: 16.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	4952.8	838.0	96.7	96.7	89.8	89.8	89.7	89.7	6438	97.5
1987	6288.1	837.0	96.9	96.8	85.9	87.6	85.8	87.4	8489	96.9
1988	4866.2	846.0	74.8	88.7	74.8	82.9	65.4	79.4	6636	75.5
1989	7280.8	860.0	97.8	91.2	96.4	86.6	96.6	84.0	8632	98.5
1990	6659.4	860.0	90.7	91.1	88.5	87.0	88.4	85.0	8065	92.1
1991	5733.6	860.0	76.4	88.5	76.3	85.1	76.1	83.4	6835	78.0
1992	6413.4	860.0	85.2	88.0	85.1	85.1	84.9	83.6	7589	86.4
1993	5802.3	860.0	78.1	86.7	78.1	84.2	77.0	82.8	8760	100.0
1994	5496.7	860.0	73.2	85.2	73.2	82.9	73.0	81.7	7577	86.5
1995	6285.1	860.0	83.5	85.0	83.5	83.0	83.4	81.8	8092	92.4
1996	5475.7	860.0	72.6	83.8	72.5	82.0	72.5	81.0	7000	79.7
1997	6154.5	860.0	81.7	83.6	81.7	82.0	81.7	81.0	7874	89.9
1998	4990.8	785.0	72.4	82.8	72.4	81.3	72.6	80.4	6474	73.9
1999	6315.7	785.0	92.3	83.5	91.8	82.0	91.8	81.2	8208	93.7
2000	5322.7	785.0	78.2	83.1	76.9	81.7	77.2	80.9	6790	77.3
2001	7026.3	790.0	100.0	84.1	100.0	82.8	101.5	82.2	8760	100.0
2002	4819.4	790.0	69.5	83.3	69.5	82.0	69.6	81.5	6121	69.9
2003	6730.2	790.0	97.7	84.1	97.7	82.9	97.3	82.3	8592	98.1
2004	6428.8	790.0	92.8	84.5	92.8	83.4	92.6	82.8	8188	93.2
2005	4890.5	790.0	70.2	83.8	70.2	82.7	70.1	82.2	6310	72.0
2006	6740.5	806.0	95.1	84.4	94.8	83.3	94.4	82.8	8486	96.9
2007	6969.9	822.0	97.3	85.0	97.1	83.9	96.8	83.4	8570	97.8
2008	5763.7	817.0	80.0	84.7	79.9	83.7	80.5	83.3	7101	81.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		480			253	
B. Refuelling without a maintenance					1	
D. Inspection, maintenance or repair without refuelling	1202			655	12	
E. Testing of plant systems or component:				12		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					4	4
L. Human factor related					3	
Z. Others					10	
Subtotal	1202	480	0	667	283	4
Total		1682			954	

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems	55	37
13. Reactor Auxiliary System:		3
14. Safety Systems	52	
15. Reactor Cooling System:		60
16. Steam generation system:	272	13
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System	101	22
41. Main Generator System:		7
42. Electrical Power Supply System:		24
XX. Miscellaneous Systems		46
Total	480	234

## 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  
 at the beginning of 2008: 782.0 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 2008

Net Energy Production: 6514.4 GW(e).h  
 Energy Availability Factor: 94.3%  
 Load Factor: 95.1%  
 Operating Factor: 99.3%  
 Energy Unavailability Factor: 5.7%  
 Total Off-line Time: 61 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	528.0	522.1	403.6	507.0	582.5	560.4	574.4	554.1	561.1	573.1	565.8	582.3	6514.4
EAF (%)	89.7	94.8	68.6	89.8	99.8	99.1	98.6	94.9	99.1	99.5	99.0	98.9	94.3
UCF (%)	89.7	94.8	68.6	89.8	99.8	99.1	99.1	95.7	100.0	99.9	99.0	98.9	94.5
LF (%)	90.7	99.3	69.4	90.2	100.1	99.5	98.7	95.2	99.7	98.4	100.5	100.1	95.1
OF (%)	91.7	103.6	100.0	100.1	100.0	100.0	100.0	96.9	100.0	99.9	100.0	100.0	99.3
EUF (%)	10.3	5.2	31.4	10.2	0.2	0.9	1.4	5.1	0.9	0.5	1.0	1.1	5.7
PUF (%)	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
UCLF (%)	10.3	4.5	31.4	10.2	0.2	0.9	0.9	4.3	0.0	0.1	1.0	1.1	5.4
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.7	0.9	0.4	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

SIGNIFICANT DERATES ASSOCIATED WITH FUELING MACHINE FAILURE ON UNIT 5. REFERENCE UNIT POWER ADJUSTED BASED ON MANAGEMENT ACCEPTED ENGINEERING ANALYSIS OF TURBINE TESTING COMPLETED ON ALL UNITS FOLLOWING TURBINE UPGRADES. THE ADJUSTMENT ON UNIT 8 WAS LARGER THEN OTHER UNITS AS UNIT 8 HAS NOT COMPLETED CORE REORDER MODIFICATIONS.

### 5. Historical Summary

Date of Construction Start: 01 Aug 1979      Lifetime Generation: 126997.0 GW(e).h  
 Date of First Criticality: 15 Feb 1987      Cumulative Energy Availability Factor: 82.2%  
 Date of Grid Connection: 09 Mar 1987      Cumulative Load Factor: 81.9%  
 Date of Commercial Operation: 22 May 1987      Cumulative Unit Capability Factor: 83.5%  
    Cumulative Energy Unavailability Factor: 17.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	3673.2	844.0	95.7	95.7	74.7	74.7	74.6	74.6	5849	99.5
1988	5958.5	837.0	86.8	90.4	86.5	81.8	81.0	78.5	7659	87.2
1989	6523.5	837.0	98.4	93.4	89.2	84.6	89.0	82.4	8661	98.9
1990	5758.7	842.0	80.7	89.9	78.1	82.8	78.0	81.2	7186	82.0
1991	6932.7	860.0	93.0	90.6	92.5	84.9	92.0	83.6	8213	93.8
1992	5451.1	860.0	72.4	87.3	72.4	82.7	72.2	81.5	6587	75.0
1993	4675.9	860.0	62.3	83.5	62.3	79.6	62.1	78.6	7064	80.6
1994	6443.2	860.0	86.0	83.8	86.0	80.4	85.5	79.5	8760	100.0
1995	6113.4	860.0	81.3	83.6	81.3	80.5	81.1	79.7	7876	89.9
1996	6957.8	860.0	92.1	84.5	92.1	81.7	92.1	81.0	8783	100.0
1997	6346.5	860.0	84.2	84.4	84.2	82.0	84.2	81.3	8003	91.4
1998	4122.4	785.0	59.9	82.5	59.8	80.2	59.9	79.6	5368	61.3
1999	4114.4	785.0	60.0	80.8	59.8	78.7	59.8	78.1	5414	61.8
2000	6530.9	785.0	93.7	81.7	93.7	79.7	94.7	79.3	8293	94.4
2001	5424.8	790.0	78.0	81.5	78.0	79.6	78.4	79.2	6852	78.2
2002	6686.0	790.0	97.0	82.4	97.0	80.7	96.6	80.3	8543	97.5
2003	4960.0	790.0	71.9	81.8	71.9	80.2	71.7	79.8	6301	71.9
2004	5695.8	790.0	83.0	81.9	82.8	80.3	82.1	79.9	7374	83.9
2005	6889.2	790.0	99.7	82.8	99.4	81.3	99.5	80.9	8745	99.8
2006	5283.9	790.0	76.6	82.5	76.4	81.1	76.3	80.7	6791	77.5
2007	6485.3	795.0	94.0	83.0	93.4	81.6	93.1	81.3	8341	95.2
2008	6514.4	782.0	94.5	83.5	94.3	82.2	95.1	81.9	8699	99.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		85			339	
B. Refuelling without a maintenance					2	
D. Inspection, maintenance or repair without refuelling				721	44	
E. Testing of plant systems or component:				0		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	
L. Human factor related					2	
Subtotal	0	85	0	721	390	0
Total		85			1111	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems	62	4
14. Safety Systems		25
15. Reactor Cooling System:		80
16. Steam generation system:		150
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries	23	14
32. Feedwater and Main Steam System		10
33. Circulating Water System		7
35. All other I&C Systems		1
41. Main Generator System:		1
42. Electrical Power Supply System:		14
XX. Miscellaneous Systems		3
Total	85	329

# 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 6125.3 GW(e).h  
 Energy Availability Factor: 79.7%  
 Load Factor: 79.6%  
 Operating Factor: 81.3%  
 Energy Unavailability Factor: 20.3%  
 Total Off-line Time: 1635 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	651.8	609.3	560.5	0.0	0.0	518.2	631.4	624.5	601.6	642.9	635.3	649.6	6125.3
EAF (%)	100.0	100.0	86.9	-0.1	0.0	83.0	96.7	95.6	95.2	99.4	100.0	100.0	79.7
UCF (%)	100.0	100.0	86.9	-0.1	0.0	83.1	100.0	100.0	99.8	99.8	100.0	100.0	80.7
LF (%)	99.8	103.3	85.8	0.0	0.0	82.0	96.7	95.6	95.2	98.3	100.5	99.4	79.6
OF (%)	100.0	103.6	87.2	0.0	0.0	86.1	100.0	100.0	100.0	99.9	100.0	100.0	81.3
EUF (%)	0.0	0.0	13.1	100.1	100.0	17.0	3.3	4.4	4.8	0.6	0.0	0.0	20.3
PUF (%)	0.0	0.0	13.1	100.1	100.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	19.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.2	0.0	0.0	0.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.1	3.3	4.4	4.6	0.3	0.0	0.0	1.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Apr 1982      Lifetime Generation: 108247.0 GW(e).h  
 Date of First Criticality: 29 Oct 1990      Cumulative Energy Availability Factor: 83.6%  
 Date of Grid Connection: 19 Dec 1990      Cumulative Load Factor: 83.0%  
 Date of Commercial Operation: 14 Nov 1992      Cumulative Unit Capability Factor: 84.6%  
    Cumulative Energy Unavailability Factor: 16.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1992	974.0	881.0	96.8	96.8	96.8	96.8	75.5	75.5	1152	78.7
1993	6016.2	881.0	79.2	81.7	78.7	81.3	78.0	77.6	7213	82.3
1994	6326.6	881.0	83.5	82.5	83.1	82.2	82.0	79.6	7446	85.0
1995	6853.3	881.0	90.7	85.1	89.7	84.5	88.8	82.5	8046	91.8
1996	5745.3	881.0	75.7	82.8	75.0	82.3	74.2	80.5	6827	77.7
1997	4765.1	881.0	63.0	79.0	62.3	78.4	61.7	76.9	7236	82.6
1998	6427.5	881.0	84.3	79.9	83.3	79.2	83.3	77.9	7717	88.1
1999	7175.1	881.0	94.4	81.9	93.0	81.1	93.0	80.0	8705	99.4
2000	6280.6	881.0	82.0	81.9	81.2	81.1	81.2	80.2	7615	86.7
2001	6980.8	881.0	91.2	82.9	90.5	82.1	90.5	81.3	8502	97.1
2002	6532.9	881.0	85.5	83.2	84.7	82.4	84.6	81.6	7887	90.0
2003	6562.4	881.0	87.5	83.5	85.1	82.6	85.0	81.9	7846	89.6
2004	5612.1	881.0	73.6	82.7	72.8	81.8	72.5	81.2	6540	74.5
2005	7366.3	881.0	97.0	83.8	96.2	82.9	95.7	82.3	8553	97.6
2006	6388.9	878.0	85.2	83.9	83.4	82.9	83.1	82.3	7520	85.8
2007	7412.6	878.0	98.2	84.8	96.8	83.9	96.4	83.2	8647	98.7
2008	6125.3	878.0	80.7	84.6	79.7	83.6	79.6	83.0	7125	81.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1991 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure	1659			554	556	4
D. Inspection, maintenance or repair without refuelling						
F. Major back-fitting, refurbishment or upgrading activities with refuelling				59		
J. Grid limitation, failure or grid unavailability						
Z. Others					1	
Subtotal	1659	0	0	613	557	4
Total	1659			1174		

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

System	2008 Hours Lost	1991 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		17
12. Reactor I&C Systems		42
13. Reactor Auxiliary System:		5
14. Safety Systems		21
15. Reactor Cooling System:		279
21. Fuel Handling and Storage Facilities		33
31. Turbine and auxiliaries		17
32. Feedwater and Main Steam System		2
35. All other I&C Systems:		36
41. Main Generator System:		71
42. Electrical Power Supply System:		12
XX. Miscellaneous Systems		10
Total	0	545

## 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 7560.9 GW(e).h  
 Energy Availability Factor: 98.1%  
 Load Factor: 98.3%  
 Operating Factor: 99.3%  
 Energy Unavailability Factor: 1.9%  
 Total Off-line Time: 64 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	655.5	614.1	656.4	577.9	614.2	633.6	644.8	628.5	610.5	644.9	636.1	644.5	7560.9
EAF (%)	100.0	100.0	100.0	91.8	94.3	100.0	98.9	96.6	96.6	99.7	100.0	99.9	98.1
UCF (%)	100.0	100.0	100.0	91.8	94.3	100.0	100.0	100.0	99.8	100.0	100.0	99.9	98.8
LF (%)	100.4	104.1	100.5	91.5	94.0	100.2	98.7	96.2	96.6	98.6	100.6	98.7	98.3
OF (%)	100.0	103.6	100.0	91.9	96.1	100.0	100.0	100.0	100.0	99.9	100.0	100.0	99.3
EUF (%)	0.0	0.0	0.0	8.2	5.7	0.0	1.1	3.4	3.4	0.3	0.0	0.1	1.9
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	8.2	5.7	0.0	0.0	0.0	0.1	0.0	0.0	0.1	1.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.4	3.3	0.3	0.0	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

A CANDU OWNERS GROUP PUBLICATION NOTED THAT 2008 YEAR-END RESULTS SHOW DARLINGTON UNIT 2 TO BE THE SECOND RANKING UNIT OF ALL CANDU PHWRs IN TERMS OF GROSS CAPACITY FACTOR.

### 5. Historical Summary

Date of Construction Start: 01 Sep 1981      Lifetime Generation: 109004.0 GW(e).h  
 Date of First Criticality: 05 Nov 1989      Cumulative Energy Availability Factor: 76.5%  
 Date of Grid Connection: 15 Jan 1990      Cumulative Load Factor: 76.3%  
 Date of Commercial Operation: 09 Oct 1990      Cumulative Unit Capability Factor: 77.5%  
    Cumulative Energy Unavailability Factor: 23.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1990	1153.5	881.0	64.9	64.9	64.9	64.9	65.7	65.7	1608	80.7
1991	51.5	881.0	0.7	12.6	0.7	12.6	0.7	12.7	102	1.2
1992	1290.2	881.0	16.7	14.4	16.7	14.4	16.7	14.5	2418	27.5
1993	6370.2	881.0	83.3	35.7	82.7	35.6	82.5	35.6	7594	86.7
1994	6750.8	881.0	88.9	48.3	88.5	48.1	87.5	47.8	8069	92.1
1995	6953.0	881.0	91.3	56.5	90.7	56.2	90.1	55.9	8104	92.5
1996	6705.7	881.0	87.8	61.6	87.2	61.2	86.7	60.9	7752	88.3
1997	4710.4	881.0	61.7	61.6	61.5	61.3	61.0	60.9	7069	80.7
1998	6227.9	881.0	81.9	64.0	80.7	63.6	80.7	63.3	7492	85.5
1999	6469.1	881.0	85.1	66.3	83.8	65.8	83.8	65.5	7824	89.3
2000	6885.4	881.0	90.1	68.7	89.0	68.1	89.0	67.8	8221	93.6
2001	5826.4	881.0	76.3	69.3	75.5	68.7	75.5	68.5	7030	80.3
2002	7268.9	881.0	95.4	71.5	94.2	70.8	94.2	70.6	8627	98.5
2003	6084.1	881.0	81.6	72.2	79.3	71.5	78.8	71.2	7245	82.7
2004	7038.4	881.0	96.7	74.0	91.4	72.9	91.0	72.6	8737	99.5
2005	6056.2	878.0	79.7	74.3	78.9	73.3	78.7	73.0	7031	80.3
2006	7548.4	878.0	99.4	75.9	98.6	74.8	98.1	74.5	8745	99.8
2007	6364.8	878.0	83.4	76.3	82.9	75.3	82.8	75.0	7327	83.6
2008	7560.9	878.0	98.8	77.5	98.1	76.5	98.3	76.3	8696	99.3



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1990 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		88			705	
D. Inspection, maintenance or repair without refuelling				505	18	
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					344	
Subtotal	0	88	0	505	1067	3
Total		88			1575	

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

System	2008 Hours Lost	1990 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	88	33
12. Reactor I&C Systems		40
13. Reactor Auxiliary System:		1
14. Safety Systems		12
15. Reactor Cooling System:		447
16. Steam generation system:		65
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries		26
32. Feedwater and Main Steam System		8
35. All other I&C Systems:		17
41. Main Generator System:		10
42. Electrical Power Supply System:		5
XX. Miscellaneous Systems		8
Total	88	676

## 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 7654.6 GW(e).h  
 Energy Availability Factor: 99.1%  
 Load Factor: 99.5%  
 Operating Factor: 100.3%  
 Energy Unavailability Factor: 0.9%  
 Total Off-line Time: -24 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	645.5	612.2	660.6	636.9	659.4	633.9	644.0	631.1	607.7	648.6	626.2	648.6	7654.6
EAF (%)	100.0	100.0	100.0	100.0	100.0	99.9	98.7	96.7	96.1	99.3	99.5	99.6	99.1
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	99.6	100.0	99.9	100.0	100.0	99.7	99.9
LF (%)	98.8	103.8	101.1	100.9	100.9	100.3	98.6	96.6	96.1	99.2	99.0	99.3	99.5
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.1	1.3	3.3	3.9	0.7	0.5	0.4	0.9
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.0	0.0	0.0	0.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.1	1.0	3.3	3.8	0.7	0.5	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

A CANDU OWNERS GROUP PUBLICATION NOTED THAT 2008 YEAR-END RESULTS SHOW DARLINGTON UNIT 3 TO BE THE TOP RANKING UNIT OF ALL CANDU PHWRs IN TERMS OF GROSS CAPACITY FACTOR.

### 5. Historical Summary

Date of Construction Start: 01 Sep 1984      Lifetime Generation: 105107.0 GW(e).h  
 Date of First Criticality: 09 Nov 1992      Cumulative Energy Availability Factor: 85.8%  
 Date of Grid Connection: 07 Dec 1992      Cumulative Load Factor: 85.3%  
 Date of Commercial Operation: 14 Feb 1993      Cumulative Unit Capability Factor: 86.6%  
    Cumulative Energy Unavailability Factor: 14.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1993	6003.4	881.0	89.8	89.8	89.2	89.2	85.0	85.0	7141	89.1
1994	6528.5	881.0	85.6	87.6	85.3	87.2	84.6	84.8	7642	87.2
1995	7061.5	881.0	92.9	89.5	92.2	88.9	91.5	87.1	8219	93.8
1996	7391.6	881.0	97.3	91.5	96.7	90.9	95.5	89.2	8574	97.6
1997	4010.8	881.0	52.4	83.5	52.1	83.0	52.0	81.7	6314	72.1
1998	7244.9	881.0	94.7	85.4	93.9	84.8	93.9	83.7	8593	98.1
1999	5629.1	881.0	75.1	83.9	72.9	83.1	72.9	82.2	6929	79.1
2000	6517.0	881.0	85.1	84.1	84.2	83.3	84.2	82.4	7822	89.0
2001	6578.0	881.0	86.3	84.3	85.2	83.5	85.2	82.7	7901	90.2
2002	6371.8	881.0	83.7	84.2	82.6	83.4	82.6	82.7	7595	86.7
2003	6827.2	881.0	89.5	84.7	88.6	83.9	88.5	83.3	8004	91.4
2004	6601.6	881.0	86.9	84.9	85.6	84.0	85.3	83.4	7649	87.1
2005	7562.0	878.0	99.1	86.0	98.3	85.1	98.2	84.6	8760	100.0
2006	5573.1	878.0	73.1	85.1	72.5	84.2	72.5	83.7	6452	73.7
2007	7221.1	878.0	94.8	85.7	93.9	84.9	93.9	84.4	8311	94.9
2008	7654.6	878.0	99.9	86.6	99.1	85.8	99.5	85.3	8784	100.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1993 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					299	
B. Refuelling without a maintenance					5	
D. Inspection, maintenance or repair without refuelling				588		
E. Testing of plant systems or component:					9	
Subtotal	0	0	0	588	313	0
Total	0			901		

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

System	2008 Hours Lost	1993 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		22
13. Reactor Auxiliary System:		17
14. Safety Systems		4
15. Reactor Cooling System:		67
16. Steam generation system:		20
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		34
31. Turbine and auxiliaries		76
32. Feedwater and Main Steam System		4
35. All other I&C Systems		33
42. Electrical Power Supply System:		11
XX. Miscellaneous Systems		6
Total	0	296

## 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 7525.5 GW(e).h  
 Energy Availability Factor: 97.3%  
 Load Factor: 97.8%  
 Operating Factor: 98.8%  
 Energy Unavailability Factor: 2.7%  
 Total Off-line Time: 108 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	653.9	612.1	652.0	634.6	655.6	635.0	592.3	626.2	611.6	575.3	637.1	639.7	7525.5
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	90.8	95.9	96.7	88.3	100.0	96.9	97.3
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	91.8	99.8	98.4	91.0	100.0	100.0	98.4
LF (%)	100.1	103.7	99.8	100.5	100.4	100.4	90.7	95.9	96.7	88.0	100.8	97.9	97.8
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	93.5	100.0	100.0	91.1	100.0	97.4	98.8
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	9.2	4.1	3.3	11.7	0.0	3.1	2.7
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.6	0.0	0.0	0.1
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	8.2	0.2	0.7	8.4	0.0	0.0	1.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	1.0	4.0	1.6	2.7	0.0	3.1	1.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

A CANDU OWNERS GROUP PUBLICATION NOTED THAT 2008 YEAR-END RESULTS SHOW DARLINGTON UNIT 4 TO BE THE THIRD RANKING UNIT OF ALL CANDU PHWRs IN TERMS OF GROSS CAPACITY FACTOR.

### 5. Historical Summary

Date of Construction Start: 01 Jul 1985      Lifetime Generation: 103195.0 GW(e).h  
 Date of First Criticality: 13 Mar 1993      Cumulative Energy Availability Factor: 85.6%  
 Date of Grid Connection: 17 Apr 1993      Cumulative Load Factor: 85.3%  
 Date of Commercial Operation: 14 Jun 1993      Cumulative Unit Capability Factor: 86.3%  
    Cumulative Energy Unavailability Factor: 14.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1993	3057.8	881.0	74.0	74.0	73.9	73.9	67.6	67.6	3616	70.4
1994	7038.7	881.0	92.2	85.5	91.8	85.2	91.2	82.5	8143	93.0
1995	6750.6	881.0	88.1	86.5	87.7	86.2	87.5	84.4	7751	88.5
1996	6105.4	881.0	79.4	84.5	79.1	84.2	78.9	82.9	7023	80.0
1997	5069.6	881.0	66.0	80.5	65.7	80.2	65.7	79.1	7428	84.8
1998	6520.9	881.0	85.3	81.3	84.5	81.0	84.5	80.1	7699	87.9
1999	6216.1	881.0	81.6	81.4	80.5	80.9	80.5	80.2	7431	84.8
2000	6975.0	881.0	90.8	82.6	90.1	82.1	90.1	81.5	8219	93.6
2001	6836.3	881.0	89.6	83.4	88.6	82.9	88.6	82.3	8037	91.7
2002	7449.8	881.0	97.3	84.9	96.5	84.3	96.5	83.8	8760	100.0
2003	5428.9	881.0	72.3	83.7	70.6	83.0	70.3	82.5	6320	72.1
2004	7321.1	881.0	95.2	84.7	94.6	84.0	94.6	83.6	8451	96.2
2005	6569.7	878.0	86.5	84.8	85.6	84.1	85.3	83.7	7617	87.0
2006	7449.4	878.0	97.1	85.7	96.5	85.0	96.9	84.7	8541	97.5
2007	6210.2	878.0	81.4	85.4	80.8	84.7	80.7	84.4	7170	81.8
2008	7525.5	878.0	98.4	86.3	97.3	85.6	97.8	85.3	8652	98.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1993 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		98			309	
D. Inspection, maintenance or repair without refuelling				609		
E. Testing of plant systems or component:				21	3	
J. Grid limitation, failure or grid unavailability						5
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			33			
Z. Others					17	
Subtotal	0	98	33	630	329	5
Total		131			964	

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

System	2008 Hours Lost	1993 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	48	55
13. Reactor Auxiliary System:		12
14. Safety Systems		21
15. Reactor Cooling System:		118
16. Steam generation system:		5
31. Turbine and auxiliaries		38
32. Feedwater and Main Steam System		14
33. Circulating Water System		9
41. Main Generator System:	50	
42. Electrical Power Supply System:		25
XX. Miscellaneous Systems		9
Total	98	306

## CA-12 GENTILLY-2

Operator: HQ (HYDRO QUEBEC)

Contractor: BBC (BROWN BOVERI ET CIE)

### 1. Station Details

Type: PHWR  
 Net Reference Unit Power  
 at the beginning of 2008: 635.0 MW(e)  
 Design Net Capacity: 645.0 MW(e)  
 Design Discharge Burnup: 7000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 3648.4 GW(e).h  
 Energy Availability Factor: 65.3%  
 Load Factor: 65.6%  
 Operating Factor: 70.9%  
 Energy Unavailability Factor: 34.7%  
 Total Off-line Time: 2553 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	353.2	459.5	48.0	0.0	203.0	450.0	376.3	423.6	439.0	439.9	455.8	3648.4
EAF (%)	0.0	79.2	97.3	10.4	0.0	44.4	95.2	79.7	92.7	92.9	96.2	96.5	65.3
UCF (%)	0.0	90.9	100.0	10.4	0.0	44.4	100.0	79.7	92.7	92.9	100.0	100.0	67.5
LF (%)	0.0	82.8	97.3	10.5	0.0	44.4	95.2	79.7	92.7	92.8	96.2	96.5	65.6
OF (%)	0.0	94.5	100.0	14.0	0.0	50.8	100.0	93.7	100.0	98.8	100.0	100.0	70.9
EUF (%)	100.0	20.8	2.7	89.6	100.0	55.6	4.8	20.3	7.3	7.1	3.8	3.5	34.7
PUF (%)	0.0	0.0	0.0	86.1	100.0	41.9	0.0	0.0	0.0	0.0	0.0	0.0	19.0
UCLF (%)	100.0	9.1	0.0	3.5	0.0	13.7	0.0	20.4	7.3	7.1	0.0	0.0	13.5
XUF (%)	0.0	11.7	2.7	0.0	0.0	0.0	4.8	0.0	0.0	0.0	3.8	3.5	2.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1- JANUARY 1ST TO FEBRUARY 2ND UNPLANNED OUTAGE : MODERATOR HEAT EXCHANGER & FUELLING MACHINE REPAIRING  
 2- FEBRUARY 13 UNPLANNED OUTAGE : ROTOR'S GROUND DETECTION RELAY REPAIRING  
 3- FEBRUARY 14 UNPLANNED OUTAGE : REPLACEMENT OF 2 CAPACITANCES IN THE GROUNDING PROTECTIVE CIRCUIT OF THE ROTOR  
 4- AVRIL 5 TO JUNE 15 PLANNED OUTAGE  
 5- JUNE 12 UNPLANNED OUTAGE : REACTOR TRIP (SHUTDOWN SYSTEM #1) CAUSED BY ELECTRICAL SYSTEM TEST (LOAD TRANSFER)  
 6- AUGUST 1 UNPLANNED OUTAGE : TURBINE TRIP ON GROUND PROTECTION RELAY DEFAULT  
 7- AUGUST 24 UNPLANNED OUTAGE : REACTOR POWER SET BACK ON CONDENSER EXTRACTION PUMP SPURIOUS TRIP  
 8- OCTOBER 20 UNPLANNED OUTAGE : TURBINE TRIP ON PHASE GROUNDING PROTECTION ON MAIN TRANSFORMER

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Apr 1974	<b>Lifetime Generation:</b>	110165.0 GW(e).h
<b>Date of First Criticality:</b>	11 Sep 1982	<b>Cumulative Energy Availability Factor:</b>	81.4%
<b>Date of Grid Connection:</b>	04 Dec 1982	<b>Cumulative Load Factor:</b>	77.9%
<b>Date of Commercial Operation:</b>	01 Oct 1983	<b>Cumulative Unit Capability Factor:</b>	83.3%
		<b>Cumulative Energy Unavailability Factor:</b>	18.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	937.7	645.0	65.9	65.9	65.9	65.9	65.8	65.8	1580	71.6
1984	3426.0	645.0	67.8	67.4	67.8	67.4	60.5	61.5	6742	76.8
1985	3189.4	645.0	72.7	69.8	71.1	69.1	56.4	59.3	6347	72.5
1986	3792.1	645.0	85.8	74.7	85.8	74.2	67.1	61.7	7488	85.5
1987	4658.5	640.0	86.3	77.4	85.5	76.8	83.1	66.7	7654	87.4
1988	5283.6	640.0	96.0	80.9	95.3	80.4	94.0	71.9	8372	95.3
1989	4870.3	640.0	90.0	82.4	89.5	81.8	86.9	74.3	7722	88.2
1990	4080.6	640.0	90.4	83.5	72.9	80.6	72.8	74.1	7748	88.4
1991	3925.5	640.0	71.4	82.0	69.9	79.3	70.0	73.6	6317	72.1
1992	4701.5	640.0	84.8	82.3	84.8	79.9	83.6	74.7	7431	84.6
1993	4827.1	685.0	92.9	83.4	92.4	81.2	80.4	75.3	7731	88.3
1994	5405.5	635.0	98.6	84.8	98.6	82.7	97.2	77.2	8634	98.6
1995	4519.0	635.0	82.5	84.6	82.5	82.7	81.2	77.5	7229	82.5
1996	5242.0	635.0	94.4	85.3	94.4	83.6	94.0	78.7	8289	94.4
1997	4217.5	635.0	78.8	84.9	78.8	83.2	75.8	78.5	6901	78.8
1998	3825.1	635.0	71.4	84.0	71.4	82.5	68.8	77.9	6258	71.4
1999	3793.3	635.0	88.6	84.3	69.9	81.7	68.2	77.3	6132	70.0
2000	4886.2	635.0	89.7	84.6	89.7	82.2	87.6	77.9	7879	89.7
2001	4711.2	635.0	88.3	84.8	88.3	82.5	84.7	78.3	7766	88.7
2002	4532.3	635.0	83.3	84.7	83.3	82.5	81.5	78.4	7366	84.1
2003	3567.1	635.0	65.2	83.8	65.2	81.7	64.1	77.7	5833	66.6
2004	4875.4	635.0	89.2	84.0	89.2	82.0	87.4	78.2	7905	90.0
2005	4486.2	635.0	83.7	84.0	83.5	82.1	80.6	78.3	7329	83.7
2006	4595.3	635.0	86.1	84.1	86.1	82.3	82.6	78.5	7541	86.1
2007	4328.6	635.0	81.3	84.0	77.8	82.1	77.8	78.4	7126	81.3
2008	3648.4	635.0	67.5	83.3	65.3	81.4	65.6	77.9	6207	70.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		912			270	
B. Refuelling without a maintenance outage					21	
D. Inspection, maintenance or repair without refuelling	1665			851	0	
E. Testing of plant systems or component				0	4	
H. Nuclear regulatory requirement					20	
J. Grid limitation, failure or grid unavailability				1	1	3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						69
Z. Others					55	
Subtotal	1665	912	0	852	371	72
Total		2577			1295	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		39
12. Reactor I&C Systems		7
13. Reactor Auxiliary System:	785	4
14. Safety Systems		4
15. Reactor Cooling System:		26
16. Steam generation system:		2
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		55
31. Turbine and auxiliaries	63	35
32. Feedwater and Main Steam System		7
41. Main Generator System:	4	49
42. Electrical Power Supply System:	12	5
XX. Miscellaneous Systems	48	12
Total	912	247



## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2792.1 GW(e).h  
**Energy Availability Factor:** 61.6%  
**Load Factor:** 61.9%  
**Operating Factor:** 71.0%  
**Energy Unavailability Factor:** 38.4%  
**Total Off-line Time:** 2539 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	305.6	297.1	66.3	351.9	55.2	0.0	277.4	321.9	337.5	278.7	146.0	354.6	2792.1
<b>EAF (%)</b>	79.8	82.3	17.3	94.9	14.4	0.0	72.4	84.0	91.0	72.8	39.4	92.5	61.6
<b>UCF (%)</b>	79.8	82.3	17.3	94.9	14.4	0.0	72.7	84.3	91.0	72.8	39.4	92.5	61.7
<b>LF (%)</b>	79.8	85.9	17.3	95.0	14.4	0.0	72.4	84.0	91.0	72.6	39.4	92.5	61.9
<b>OF (%)</b>	93.5	97.8	25.5	100.1	17.3	0.0	88.7	100.0	100.0	80.3	50.4	100.0	71.0
<b>EUF (%)</b>	20.3	17.7	82.7	5.1	85.6	100.0	27.6	16.0	9.0	27.2	60.6	7.5	38.4
<b>PUF (%)</b>	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	2.6	0.5
<b>UCLF (%)</b>	17.5	17.7	82.7	5.1	85.6	100.0	27.3	14.9	9.0	27.2	60.6	4.9	37.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jun 1966	<b>Lifetime Generation:</b>	84389.0 GW(e).h
<b>Date of First Criticality:</b>	25 Feb 1971	<b>Cumulative Energy Availability Factor:</b>	65.5%
<b>Date of Grid Connection:</b>	04 Apr 1971	<b>Cumulative Load Factor:</b>	62.5%
<b>Date of Commercial Operation:</b>	29 Jul 1971	<b>Cumulative Unit Capability Factor:</b>	65.7%
		<b>Cumulative Energy Unavailability Factor:</b>	34.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1971	1921.7	514.0	100.0	100.0	100.0	100.0	84.7	84.7	3546	80.3
1972	2207.9	514.0	100.0	100.0	100.0	100.0	48.9	60.9	4117	46.9
1973	4222.4	514.0	94.0	97.6	94.0	97.6	92.3	73.5	8523	95.7
1974	3232.0	514.0	71.9	90.3	71.9	90.3	72.0	73.1	6979	79.9
1975	3592.8	512.0	80.2	88.1	80.2	88.1	80.3	74.7	7234	82.8
1976	4169.7	514.0	92.7	88.9	92.7	88.9	92.6	77.9	8136	92.9
1977	3852.8	514.0	85.8	88.4	85.8	88.4	85.8	79.1	7545	86.4
1978	4273.7	515.0	95.1	89.3	95.1	89.3	95.0	81.2	8359	95.7
1979	3781.4	515.0	85.3	88.8	85.3	88.8	82.9	81.4	7554	85.3
1980	3356.9	515.0	73.7	87.2	73.7	87.2	74.2	80.7	6640	75.6
1981	3947.7	515.0	88.0	87.3	88.0	87.3	87.5	81.3	7795	89.0
1982	3499.3	515.0	77.8	86.5	77.8	86.5	77.6	81.0	6915	78.9
1983	3070.8	515.0	68.1	85.0	68.1	85.0	68.1	80.0	6101	69.6
1984	0.0	515.0	0.0	78.7	0.0	78.7	0.0	74.0	0	0.0
1985	0.0	515.0	0.0	73.3	0.0	73.3	0.0	68.9	0	0.0
1986	0.0	515.0	0.0	68.6	0.0	68.6	0.0	64.5	0	0.0
1987	832.8	515.0	19.7	65.6	17.4	65.5	18.5	61.7	1981	22.6
1988	3986.5	515.0	89.2	67.0	89.1	66.8	88.1	63.2	8224	93.6
1989	3222.1	515.0	72.7	67.3	72.6	67.1	71.4	63.7	6943	79.3
1990	3041.7	515.0	70.9	67.5	70.6	67.3	67.4	63.8	7435	84.9
1991	3051.1	515.0	67.8	67.5	67.8	67.3	67.6	64.0	6525	74.5
1992	2920.0	515.0	65.4	67.4	65.4	67.2	64.5	64.1	5798	66.0
1993	3451.2	515.0	78.4	67.9	78.4	67.7	76.5	64.6	6908	78.9
1994	897.6	515.0	20.1	65.8	20.1	65.7	19.9	62.7	1835	20.9
1995	2013.2	515.0	45.7	65.0	44.8	64.9	44.6	62.0	4234	48.3
1996	3011.8	515.0	66.8	65.1	66.8	64.9	66.6	62.2	6202	70.6
1997	3950.8	515.0	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	515.0	96.9	66.4	96.9	66.3	38.8	62.8	1230	42.0
2006	3470.5	515.0	77.2	66.8	77.0	66.6	76.9	63.3	7260	82.9
2007	1750.3	515.0	38.9	65.8	38.9	65.7	38.8	62.5	3447	39.3
2008	2792.1	515.0	61.7	65.7	61.6	65.5	61.9	62.5	6221	71.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2564			1516	
B. Refuelling without a maintenance					61	
D. Inspection, maintenance or repair without refuelling				569		
E. Testing of plant systems or component				5	6	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					12	79
Subtotal	0	2564	0	574	1595	80
Total		2564			2249	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		916
12. Reactor I&C Systems		62
13. Reactor Auxiliary System:		52
14. Safety Systems		65
15. Reactor Cooling System:	173	106
16. Steam generation system:		63
21. Fuel Handling and Storage Facilities	1419	
31. Turbine and auxiliaries	468	22
32. Feedwater and Main Steam System	504	13
35. All other I&C Systems		2
41. Main Generator System:		55
42. Electrical Power Supply System:		120
XX. Miscellaneous Systems		8
Total	2564	1484

## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3656.4 GW(e).h  
**Energy Availability Factor:** 80.8%  
**Load Factor:** 81.0%  
**Operating Factor:** 88.6%  
**Energy Unavailability Factor:** 19.2%  
**Total Off-line Time:** 995 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	356.4	341.7	368.7	352.7	361.6	297.9	357.4	358.9	245.2	364.4	73.6	177.9	3656.4
<b>EAF (%)</b>	93.0	95.2	96.2	95.1	94.4	80.3	93.3	93.7	66.1	95.1	19.9	46.4	80.8
<b>UCF (%)</b>	93.0	95.2	96.2	95.1	94.4	80.3	93.6	93.9	66.1	95.1	20.3	46.4	80.9
<b>LF (%)</b>	93.0	98.7	96.2	95.2	94.4	80.3	93.3	93.7	66.1	95.0	19.9	46.4	81.0
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	89.7	100.0	100.0	75.1	99.9	24.0	70.6	88.6
<b>EUF (%)</b>	7.0	4.8	3.8	4.9	5.6	19.7	6.7	6.3	33.9	4.9	80.1	53.6	19.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.0	0.1
<b>UCLF (%)</b>	7.0	4.8	3.8	4.9	5.6	19.7	6.4	6.1	33.9	4.5	79.3	53.6	19.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.4	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1968	<b>Lifetime Generation:</b>	89619.0 GW(e).h
<b>Date of First Criticality:</b>	16 May 1973	<b>Cumulative Energy Availability Factor:</b>	66.5%
<b>Date of Grid Connection:</b>	21 May 1973	<b>Cumulative Load Factor:</b>	66.3%
<b>Date of Commercial Operation:</b>	17 Jun 1973	<b>Cumulative Unit Capability Factor:</b>	66.9%
		<b>Cumulative Energy Unavailability Factor:</b>	33.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	2226.6	514.0	90.5	90.5	90.5	90.5	90.2	90.2	4402	91.7
1974	4221.0	514.0	94.0	92.8	94.0	92.8	94.0	92.7	8356	95.7
1975	1094.2	513.0	24.2	65.9	24.2	65.9	24.4	65.9	2201	25.2
1976	3089.0	514.0	68.2	66.6	68.2	66.6	68.6	66.7	6063	69.2
1977	4107.2	514.0	90.3	71.8	90.3	71.8	91.5	72.1	7975	91.3
1978	4033.9	515.0	89.7	75.0	89.7	75.0	89.7	75.3	7876	90.2
1979	4102.2	515.0	91.0	77.5	91.0	77.5	89.9	77.6	8059	91.0
1980	3700.5	515.0	81.8	78.1	81.8	78.1	81.8	78.1	7321	83.3
1981	4142.0	515.0	91.7	79.6	91.7	79.6	91.8	79.7	8078	92.2
1982	4137.9	515.0	91.8	80.9	91.8	80.9	91.7	81.0	8087	92.3
1983	4170.2	515.0	92.3	82.0	92.3	82.0	92.4	82.1	8183	93.4
1984	3733.3	515.0	82.7	82.1	82.7	82.1	82.5	82.1	7425	84.5
1985	3438.9	515.0	83.5	82.2	77.5	81.7	76.2	81.6	6824	77.9
1986	3687.4	515.0	83.2	82.3	83.2	81.8	81.7	81.6	7410	84.6
1987	3770.4	515.0	84.3	82.4	84.0	82.0	83.6	81.8	7495	85.6
1988	3166.2	515.0	70.1	81.6	70.1	81.2	70.0	81.0	6525	74.3
1989	2255.5	515.0	50.0	79.7	50.0	79.3	50.0	79.1	5468	62.4
1990	1070.8	515.0	23.7	76.5	23.7	76.1	23.7	76.0	2851	32.5
1991	2130.8	515.0	47.3	74.9	47.3	74.6	47.2	74.4	5185	59.2
1992	0.0	515.0	0.0	71.1	0.0	70.8	0.0	70.6	0	0.0
1993	3309.6	515.0	74.2	71.2	73.8	70.9	73.4	70.8	6711	76.6
1994	4009.6	515.0	89.7	72.1	89.5	71.8	88.9	71.6	7915	90.4
1995	2807.0	515.0	63.8	71.7	63.3	71.4	62.2	71.2	5684	64.9
1996	1134.9	515.0	25.1	69.7	25.1	69.4	25.1	69.2	2230	25.4
1997	0.0	515.0	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	515.0	69.7	66.9	69.7	66.6	69.7	66.4	1880	79.9
2004	3266.8	515.0	75.6	67.3	72.1	66.8	72.2	66.7	6739	76.7
2005	2996.5	515.0	66.5	67.2	66.4	66.8	66.4	66.6	5900	67.4
2006	2976.5	515.0	66.3	67.2	66.0	66.8	66.0	66.6	6149	70.2
2007	1959.1	515.0	43.4	66.4	43.4	66.0	43.4	65.8	4086	46.6
2008	3656.4	515.0	80.9	66.9	80.8	66.5	81.0	66.3	7765	88.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1973 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1019			1001	
B. Refuelling without a maintenance					3	
D. Inspection, maintenance or repair without refuelling				1107		
E. Testing of plant systems or component				62		
J. Grid limitation, failure or grid unavailability						5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					7	14
Subtotal	0	1019	0	1169	1011	19
Total		1019			2199	

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

System	2008 Hours Lost	1973 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		44
12. Reactor I&C Systems	522	71
13. Reactor Auxiliary System:		175
14. Safety Systems		14
15. Reactor Cooling System:	434	468
16. Steam generation system:	19	
31. Turbine and auxiliaries		38
32. Feedwater and Main Steam System	44	28
35. All other I&C Systems:		3
41. Main Generator System:		52
42. Electrical Power Supply System:		96
XX. Miscellaneous Systems		1
Total	1019	990

# 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 4026.8 GW(e).h  
 Energy Availability Factor: 88.8%  
 Load Factor: 89.1%  
 Operating Factor: 95.4%  
 Energy Unavailability Factor: 11.2%  
 Total Off-line Time: 403 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	370.4	347.1	369.5	347.9	252.4	332.2	365.5	361.3	351.6	368.3	349.6	211.1	4026.8
EAF (%)	96.7	96.5	96.2	93.6	65.7	89.4	95.2	94.1	94.6	95.9	94.1	55.0	88.8
UCF (%)	96.9	97.7	97.2	94.7	66.6	89.9	97.2	95.7	96.8	96.8	94.1	55.0	89.8
LF (%)	96.5	100.1	96.2	93.8	65.7	89.4	95.2	94.1	94.6	95.8	94.1	55.0	89.1
OF (%)	100.0	103.6	100.0	100.1	77.3	100.0	100.0	100.0	100.0	99.9	100.0	65.3	95.4
EUf (%)	3.3	3.5	3.8	6.4	34.3	10.6	4.8	5.9	5.4	4.1	5.9	45.0	11.2
PUF (%)	0.0	0.0	0.0	0.0	9.8	5.9	0.0	0.0	0.0	0.0	0.0	0.0	1.3
UCLF (%)	3.1	2.3	2.8	5.3	23.6	4.2	2.8	4.3	3.2	3.2	5.9	45.0	8.9
XUF (%)	0.3	1.2	1.0	1.1	0.9	0.5	2.0	1.6	2.2	0.8	0.0	0.0	0.9

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Nov 1974      Lifetime Generation: 85533.0 GW(e).h  
 Date of First Criticality: 23 Oct 1982      Cumulative Energy Availability Factor: 73.5%  
 Date of Grid Connection: 19 Dec 1982      Cumulative Load Factor: 73.3%  
 Date of Commercial Operation: 10 May 1983      Cumulative Unit Capability Factor: 74.0%  
    Cumulative Energy Unavailability Factor: 26.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	2719.9	516.0	90.3	90.3	90.3	90.3	89.6	89.6	5446	92.6
1984	3517.5	516.0	77.8	82.8	77.8	82.8	77.6	82.4	7035	80.1
1985	3366.5	516.0	83.1	82.9	77.7	80.9	74.5	79.5	6989	79.8
1986	4068.6	516.0	91.2	85.1	90.7	83.6	90.0	82.3	8057	92.0
1987	3600.1	516.0	80.3	84.1	79.6	82.7	79.6	81.8	7148	81.6
1988	4397.2	516.0	97.5	86.5	97.5	85.3	97.0	84.5	8683	98.9
1989	3400.8	516.0	75.7	84.9	75.4	83.8	75.2	83.1	6862	78.3
1990	3885.0	516.0	86.4	85.1	86.4	84.2	85.9	83.4	7821	89.3
1991	2887.1	516.0	64.6	82.7	64.4	81.9	63.9	81.2	5724	65.3
1992	1345.2	516.0	29.8	77.2	29.8	76.5	29.7	75.9	2621	29.8
1993	3841.8	516.0	85.6	78.0	85.4	77.3	85.0	76.7	8307	94.8
1994	3074.4	516.0	68.5	77.2	68.5	76.6	68.0	76.0	6196	70.7
1995	3372.9	516.0	75.0	77.0	74.8	76.4	74.6	75.9	7008	80.0
1996	3042.6	516.0	67.1	76.3	67.1	75.7	67.1	75.2	6429	73.2
1997	3924.9	516.0	86.8	77.0	86.8	76.5	86.8	76.0	7908	90.3
1998	3490.6	516.0	77.2	77.0	77.2	76.5	77.2	76.1	7296	83.3
1999	2511.6	516.0	55.6	75.7	55.6	75.3	55.6	74.9	5302	60.5
2000	2631.5	516.0	58.1	74.7	58.0	74.3	58.1	73.9	5457	62.1
2001	2980.2	516.0	66.6	74.3	65.9	73.9	65.9	73.5	5986	68.3
2002	2655.7	516.0	59.2	73.5	58.8	73.1	58.8	72.7	5565	63.5
2003	3295.0	516.0	71.1	73.4	69.1	72.9	72.9	72.7	6566	75.0
2004	4159.8	516.0	92.6	74.3	92.2	73.8	91.8	73.6	8264	94.1
2005	2352.8	516.0	53.6	73.4	52.6	72.9	52.1	72.7	4818	55.0
2006	4010.9	516.0	89.7	74.1	88.9	73.5	88.7	73.3	8113	92.6
2007	2567.6	516.0	57.5	73.4	57.0	72.9	56.8	72.7	5637	64.3
2008	4026.8	516.0	89.8	74.0	88.8	73.5	89.1	73.3	8357	95.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		386			899	
B. Refuelling without a maintenance					70	
D. Inspection, maintenance or repair without refuelling	40			865		
E. Testing of plant systems or component:				0	2	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				35	10	17
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.						1
Z. Others					20	
Subtotal	40	386	0	900	1001	18
Total		426			1919	

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		83
13. Reactor Auxiliary Systems	116	68
14. Safety Systems		24
15. Reactor Cooling System	258	106
16. Steam generation system		365
31. Turbine and auxiliaries	12	45
32. Feedwater and Main Steam System		10
33. Circulating Water System		6
35. All other I&C Systems		7
41. Main Generator System		100
42. Electrical Power Supply System		72
Total	386	889



# 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 4323.8 GW(e).h  
 Energy Availability Factor: 95.6%  
 Load Factor: 95.7%  
 Operating Factor: 97.3%  
 Energy Unavailability Factor: 4.4%  
 Total Off-line Time: 239 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	345.2	358.9	380.8	367.5	379.8	251.5	376.9	375.2	360.8	381.2	368.3	377.5	4323.8
EAF (%)	89.9	99.9	99.4	98.6	98.8	68.2	98.6	98.4	97.5	99.6	99.2	99.2	95.6
UCF (%)	89.9	99.9	99.4	98.6	98.8	68.2	99.0	99.0	98.1	99.8	99.2	99.2	95.8
LF (%)	89.9	103.5	99.2	99.1	98.9	67.7	98.2	97.7	97.1	99.2	99.1	98.3	95.7
OF (%)	92.1	103.6	100.0	100.1	100.0	71.7	100.0	100.0	100.0	99.9	100.0	100.0	97.3
EUF (%)	10.1	0.1	0.6	1.4	1.2	31.8	1.4	1.6	2.5	0.4	0.8	0.8	4.4
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 (%)	10.1	0.1	0.6	1.4	1.2	31.8	1.0	1.0	1.9	0.2	0.8	0.8	4.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.6	0.6	0.2	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Oct 1975      Lifetime Generation: 87510.0 GW(e).h  
 Date of First Criticality: 15 Oct 1983      Cumulative Energy Availability Factor: 77.2%  
 Date of Grid Connection: 08 Nov 1983      Cumulative Load Factor: 77.2%  
 Date of Commercial Operation: 01 Feb 1984      Cumulative Unit Capability Factor: 77.9%  
    Cumulative Energy Unavailability Factor: 22.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	3562.9	516.0	86.1	86.1	86.1	86.1	85.9	85.9	7048	87.7
1985	3289.1	516.0	79.5	82.6	73.1	79.3	72.8	79.0	6540	74.7
1986	3395.2	516.0	76.1	80.4	75.8	78.1	75.1	77.7	6763	77.2
1987	3949.9	516.0	88.5	82.5	86.6	80.3	87.4	80.2	7791	88.9
1988	4496.8	516.0	98.5	85.7	98.4	84.0	99.2	84.0	8775	99.9
1989	3950.2	516.0	87.9	86.1	87.6	84.6	87.4	84.6	7794	89.0
1990	3473.5	516.0	77.7	84.9	76.9	83.5	76.8	83.5	7017	80.1
1991	4469.7	516.0	99.2	86.7	99.0	85.4	98.9	85.4	8721	99.6
1992	4050.5	516.0	89.3	87.0	89.3	85.9	89.4	85.9	7936	90.3
1993	2689.2	516.0	60.4	84.3	59.9	83.3	59.5	83.2	5506	62.9
1994	4043.0	516.0	90.2	84.8	90.1	83.9	89.4	83.8	8036	91.7
1995	3493.3	516.0	77.5	84.2	77.2	83.3	77.3	83.2	6962	79.5
1996	2591.7	516.0	57.2	82.1	57.2	81.3	57.2	81.2	5707	65.0
1997	3386.2	516.0	74.9	81.6	74.9	80.8	74.9	80.8	6841	78.1
1998	3130.1	516.0	69.7	80.8	69.2	80.1	69.2	80.0	6384	72.9
1999	3353.7	516.0	74.4	80.4	74.2	79.7	74.2	79.6	6863	78.3
2000	2738.7	516.0	60.6	79.2	60.5	78.5	60.4	78.5	6449	73.4
2001	2618.1	516.0	57.7	78.0	57.7	77.4	57.9	77.3	5286	60.3
2002	3982.3	516.0	88.9	78.6	88.3	78.0	88.1	77.9	7985	91.2
2003	3267.4	516.0	74.3	78.4	72.5	77.7	72.3	77.6	6566	75.0
2004	2780.8	516.0	61.7	77.6	61.5	76.9	61.4	76.9	5597	63.7
2005	2850.1	516.0	64.3	77.0	63.1	76.3	63.1	76.2	5596	63.9
2006	3899.5	516.0	86.1	77.4	86.0	76.7	86.3	76.7	7635	87.2
2007	3216.5	516.0	71.3	77.1	70.8	76.5	71.2	76.4	6588	75.2
2008	4323.8	516.0	95.8	77.9	95.6	77.2	95.7	77.2	8521	97.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		263			654	
B. Refuelling without a maintenance					51	
D. Inspection, maintenance or repair without refuelling				920		
E. Testing of plant systems or component				0	4	
J. Grid limitation, failure or grid unavailability						24
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	23
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Subtotal	0	263	0	920	712	49
Total		263			1681	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		62
12. Reactor I&C Systems		55
13. Reactor Auxiliary System		41
14. Safety Systems		53
15. Reactor Cooling System		52
16. Steam generation system	75	135
21. Fuel Handling and Storage Facilities		13
31. Turbine and auxiliaries	129	54
32. Feedwater and Main Steam System	59	46
33. Circulating Water System		3
35. All other I&C Systems		4
41. Main Generator System		80
42. Electrical Power Supply System		14
XX. Miscellaneous Systems		27
Total	263	639

# 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 1530.3 GW(e).h  
 Energy Availability Factor: 33.8%  
 Load Factor: 33.9%  
 Operating Factor: 35.2%  
 Energy Unavailability Factor: 66.2%  
 Total Off-line Time: 5676 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	379.2	356.1	381.2	63.6	0.0	0.0	0.0	0.0	0.0	0.0	2.5	347.7	1530.3
EAF (%)	99.9	100.0	99.9	17.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7	90.7	33.8
UCF (%)	99.9	100.0	99.9	17.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7	90.7	33.8
LF (%)	98.8	102.7	99.3	17.1	0.0	0.0	0.0	0.0	0.0	0.0	0.7	90.6	33.9
OF (%)	100.0	103.6	100.0	17.2	0.0	0.0	0.0	0.0	0.0	0.0	4.4	100.0	35.2
EUF (%)	0.1	0.0	0.1	83.0	100.0	100.0	100.0	100.0	100.0	99.9	99.3	9.3	66.2
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 (%)	0.1	0.0	0.1	83.0	100.0	100.0	100.0	100.0	100.0	99.9	99.3	9.3	66.2
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Mar 1976      Lifetime Generation: 83621.0 GW(e).h  
 Date of First Criticality: 22 Oct 1984      Cumulative Energy Availability Factor: 77.0%  
 Date of Grid Connection: 17 Nov 1984      Cumulative Load Factor: 76.7%  
 Date of Commercial Operation: 01 Jan 1985      Cumulative Unit Capability Factor: 77.7%  
    Cumulative Energy Unavailability Factor: 23.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	4094.0	516.0	99.0	99.0	92.6	92.6	90.6	90.6	8277	94.5
1986	3373.3	516.0	75.5	87.2	75.2	83.9	74.6	82.6	7002	79.9
1987	4339.9	516.0	97.4	90.6	96.0	87.9	96.0	87.1	8642	98.7
1988	4340.4	516.0	95.9	92.0	95.4	89.8	95.8	89.2	8519	97.0
1989	3408.7	516.0	77.1	89.0	75.4	86.9	75.4	86.5	6939	79.2
1990	3500.8	516.0	78.4	87.2	77.7	85.4	77.4	85.0	7420	84.7
1991	4258.8	516.0	94.9	88.3	94.5	86.7	94.2	86.3	8436	96.3
1992	3727.4	516.0	82.4	87.6	82.4	86.2	82.2	85.8	7349	83.7
1993	4415.9	516.0	99.9	89.0	99.0	87.6	97.7	87.1	8760	100.0
1994	3709.9	516.0	83.4	88.4	83.4	87.2	82.1	86.6	7386	84.3
1995	4056.8	516.0	90.4	88.6	90.0	87.4	89.7	86.9	8140	92.9
1996	2050.7	516.0	45.4	85.0	45.4	83.9	45.2	83.4	4416	50.3
1997	2936.2	516.0	65.0	83.4	65.0	82.5	65.0	82.0	6208	70.9
1998	3084.7	516.0	68.9	82.4	68.2	81.4	68.2	81.0	6495	74.1
1999	4433.8	516.0	98.8	83.5	98.0	82.5	98.1	82.2	8751	99.9
2000	2099.0	516.0	46.4	81.2	46.3	80.3	46.3	79.9	4445	50.6
2001	4020.8	516.0	89.0	81.6	88.7	80.8	89.0	80.4	7968	91.0
2002	4246.9	516.0	94.4	82.3	93.9	81.5	94.0	81.2	8538	97.5
2003	1790.7	516.0	39.8	80.1	39.7	79.3	39.6	79.0	3811	43.5
2004	3116.1	516.0	68.9	79.5	68.9	78.8	68.7	78.5	6127	69.8
2005	4390.8	516.0	97.8	80.4	97.4	79.7	97.1	79.4	8658	98.8
2006	2652.6	516.0	59.1	79.4	59.1	78.7	58.7	78.4	5311	60.6
2007	3667.9	516.0	82.0	79.6	81.7	78.9	81.1	78.6	7540	86.1
2008	1530.3	516.0	33.8	77.7	33.8	77.0	33.9	76.7	3084	35.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		5700			438	
B. Refuelling without a maintenance					169	
D. Inspection, maintenance or repair without refuelling				774		
E. Testing of plant systems or component				1	12	
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					8	18
Z. Others					38	
Subtotal	0	5700	0	775	665	21
Total		5700			1461	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	2784	1
12. Reactor I&C Systems	144	26
13. Reactor Auxiliary System:	53	18
14. Safety Systems	72	43
15. Reactor Cooling System:	395	88
16. Steam generation system:	720	24
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		16
33. Circulating Water System		14
41. Main Generator System:		97
42. Electrical Power Supply System:	1532	9
XX. Miscellaneous Systems		65
Total	5700	430

## 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 2918.7 GW(e).h  
 Energy Availability Factor: 64.3%  
 Load Factor: 64.6%  
 Operating Factor: 69.8%  
 Energy Unavailability Factor: 35.7%  
 Total Off-line Time: 2644 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	370.6	207.5	0.0	0.0	204.6	356.8	169.8	154.6	354.2	366.3	362.7	371.6	2918.7
EAF (%)	96.5	56.3	0.0	-0.1	53.3	96.1	44.2	40.3	95.3	95.6	97.6	96.8	64.3
UCF (%)	97.6	56.3	0.0	-0.1	53.3	96.1	44.3	40.9	96.9	96.0	97.6	96.8	64.6
LF (%)	96.5	59.8	0.0	0.0	53.3	96.1	44.2	40.3	95.3	95.3	97.6	96.8	64.6
OF (%)	100.0	62.8	0.0	0.0	69.4	100.0	48.4	57.3	100.0	99.9	100.0	100.0	69.8
EUF (%)	3.5	43.7	100.0	100.1	46.7	3.9	55.8	59.7	4.7	4.4	2.4	3.2	35.7
PUF (%)	0.2	42.0	100.0	60.1	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.1
UCLF (%)	2.3	1.7	0.0	40.1	41.3	4.0	55.7	59.1	3.1	4.1	2.4	3.2	18.3
XUF (%)	1.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	1.6	0.4	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Sep 1976      Lifetime Generation: 78044.0 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: 76.2%  
    Cumulative Energy Unavailability Factor: 24.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	3771.0	516.0	92.2	92.2	91.9	91.9	91.2	91.2	7846	97.9
1987	3759.4	516.0	84.7	88.3	83.3	87.4	83.2	87.0	7585	86.6
1988	3710.4	516.0	82.5	86.3	82.3	85.6	81.9	85.2	7296	83.1
1989	4295.2	516.0	96.6	88.9	95.4	88.1	95.0	87.7	8569	97.8
1990	3014.7	516.0	66.7	84.4	66.6	83.7	66.7	83.5	6743	77.0
1991	4485.0	516.0	99.5	87.0	98.9	86.3	99.2	86.1	8759	100.0
1992	4212.0	516.0	93.0	87.8	92.9	87.3	92.9	87.1	8280	94.3
1993	3670.5	516.0	82.1	87.1	81.7	86.6	81.2	86.4	7233	82.6
1994	4341.9	516.0	96.8	88.2	96.8	87.7	96.1	87.4	8579	97.9
1995	4012.1	516.0	89.4	88.3	89.0	87.9	88.8	87.6	8066	92.1
1996	1300.3	516.0	28.7	82.9	28.7	82.4	28.7	82.2	2597	29.6
1997	360.8	516.0	8.0	76.6	8.0	76.2	8.0	75.9	995	11.3
1998	3493.6	516.0	78.0	76.7	77.3	76.3	77.3	76.0	7009	80.0
1999	3509.1	516.0	78.4	76.8	77.6	76.4	77.6	76.2	7077	80.8
2000	2711.2	516.0	60.8	75.7	59.9	75.2	59.8	75.1	5508	62.7
2001	3502.2	516.0	78.2	75.9	77.5	75.4	77.5	75.2	6999	79.9
2002	3605.4	516.0	81.1	76.2	80.0	75.7	79.8	75.5	7244	82.7
2003	3921.3	516.0	89.7	76.9	86.9	76.3	86.8	76.1	8026	91.6
2004	2489.5	516.0	55.4	75.8	55.1	75.2	54.9	75.0	5182	59.0
2005	4195.2	516.0	94.6	76.7	93.4	76.1	92.8	75.9	8431	96.2
2006	2908.5	516.0	65.1	76.2	64.8	75.5	64.3	75.3	5853	66.8
2007	3843.2	516.0	87.3	76.7	85.5	76.0	85.0	75.8	8015	91.5
2008	2918.7	516.0	64.6	76.2	64.3	75.5	64.6	75.3	6116	69.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1218			410	
B. Refuelling without a maintenance outage				232	226	
D. Inspection, maintenance or repair without refuelling	1450			858		
E. Testing of plant systems or components				1		
J. Grid limitation, failure or grid unavailability						5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						7
Subtotal	1450	1218	0	1091	640	12
Total	2668			1743		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		32
13. Reactor Auxiliary System:		3
14. Safety Systems		21
15. Reactor Cooling System:	617	93
16. Steam generation system:		24
21. Fuel Handling and Storage Facilities		16
31. Turbine and auxiliaries:	199	37
32. Feedwater and Main Steam System	85	37
33. Circulating Water System		10
35. All other I&C Systems:		1
41. Main Generator System:		14
42. Electrical Power Supply System:	317	26
XX. Miscellaneous Systems		20
Total	1218	334

# 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  
 at the beginning of 2008: 635.0 MW(e)  
 Design Net Capacity: 630.0 MW(e)  
 Design Discharge Burnup: 8000 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 1150.6 GW(e).h  
 Energy Availability Factor: 24.0%  
 Load Factor: 20.6%  
 Operating Factor: 24.0%  
 Energy Unavailability Factor: 76.0%  
 Total Off-line Time: 6673 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	408.0	379.8	362.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1150.6
EAF (%)	100.0	100.0	90.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0
UCF (%)	100.0	100.0	90.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0
LF (%)	86.4	85.9	76.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.6
OF (%)	100.0	100.0	90.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0
EUF (%)	0.0	0.0	9.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	76.0
PUF (%)	0.0	0.0	9.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	76.0
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. 2008 Summary of Operation

REFURBISHMENT OUTAGE STARTED ON MARCH 28

## 5. Historical Summary

Date of Construction Start: 01 May 1975      Lifetime Generation: 114945.7 GW(e).h  
 Date of First Criticality: 25 Jul 1982      Cumulative Energy Availability Factor: 80.4%  
 Date of Grid Connection: 11 Sep 1982      Cumulative Load Factor: 79.5%  
 Date of Commercial Operation: 01 Feb 1983      Cumulative Unit Capability Factor: 81.5%  
    Cumulative Energy Unavailability Factor: 19.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	4404.5	640.0	86.0	86.0	86.0	86.0	85.9	85.9	7164	89.4
1984	5000.9	635.0	89.0	87.6	88.9	87.5	89.7	87.8	7927	90.2
1985	5421.9	635.0	96.9	90.8	96.9	90.7	97.5	91.1	8547	97.6
1986	5223.1	635.0	94.0	91.6	93.4	91.4	93.9	91.8	8257	94.3
1987	5107.7	635.0	91.2	91.5	91.2	91.4	91.8	91.8	8110	92.6
1988	5338.3	635.0	94.9	92.1	94.9	92.0	95.7	92.5	8383	95.4
1989	5266.7	635.0	93.8	92.3	93.6	92.2	94.7	92.8	8271	94.4
1990	5333.7	635.0	95.0	92.7	94.7	92.5	95.9	93.2	8384	95.7
1991	5437.2	635.0	96.7	93.1	96.7	93.0	97.7	93.7	8500	97.0
1992	4829.8	635.0	85.8	92.4	85.8	92.3	86.6	93.0	7748	88.2
1993	5320.0	635.0	95.1	92.6	95.1	92.5	95.6	93.2	8391	95.8
1994	5230.1	635.0	93.5	92.7	93.5	92.6	94.0	93.3	8270	94.4
1995	1611.4	635.0	29.0	87.8	29.0	87.7	29.0	88.3	2615	29.9
1996	4587.8	635.0	81.4	87.3	81.4	87.2	82.3	87.9	7363	83.8
1997	3455.6	635.0	62.2	85.6	61.6	85.5	62.1	86.2	5564	63.5
1998	3782.4	635.0	67.1	84.5	66.0	84.3	68.0	85.0	6111	69.8
1999	4082.7	635.0	75.5	83.9	72.0	83.6	73.4	84.3	6797	77.6
2000	3966.9	635.0	77.6	83.6	70.5	82.8	71.1	83.6	6792	77.3
2001	4451.3	635.0	84.6	83.6	79.1	82.6	80.0	83.4	7418	84.7
2002	3760.6	635.0	71.6	83.0	67.6	81.9	67.6	82.6	6107	69.7
2003	4739.5	635.0	89.8	83.4	84.4	82.0	85.2	82.7	7869	89.8
2004	4299.7	635.0	83.3	83.4	82.6	82.0	77.1	82.5	7310	83.2
2005	4372.6	635.0	86.8	83.5	86.8	82.2	78.6	82.3	7632	87.1
2006	4362.0	635.0	88.7	83.7	88.7	82.5	78.4	82.1	7755	88.5
2007	4121.8	635.0	85.9	83.8	85.9	82.6	74.1	81.8	7511	85.7
2008	1150.6	635.0	24.0	81.5	24.0	80.4	20.6	79.5	2111	24.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					270	1
B. Refuelling without a maintenance					78	
C. Inspection, maintenance or repair combined with refuelling				21		
D. Inspection, maintenance or repair without refuelling				491		
E. Testing of plant systems or component				0	2	
F. Major back-fitting, refurbishment or upgrading activities with refuelling	6673					
G. Major back-fitting, refurbishment or upgrading activities without refuelling				34		
H. Nuclear regulatory requirement					2	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						1
L. Human factor related					2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Z. Others					34	
Subtotal	6673	0	0	546	388	5
Total	6673			939		

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems		26
13. Reactor Auxiliary System:		5
14. Safety Systems		27
15. Reactor Cooling System:		70
16. Steam generation system:		59
21. Fuel Handling and Storage Facilities		5
31. Turbine and auxiliaries:		15
32. Feedwater and Main Steam System		21
41. Main Generator System:		8
42. Electrical Power Supply System:		6
Total	0	261



## CN-2 GUANGDONG-1

**Operator:** GNPJVC (GUANDONG NUCLEAR POWER JOINT VENTURE COMPANY LIMITED(GNPJVC))

**Contractor:** GEC (GENERAL ELECTRIC COMPANY (UK))

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 8255.5 GW(e).h  
**Energy Availability Factor:** 99.7%  
**Load Factor:** 99.8%  
**Operating Factor:** 100.2%  
**Energy Unavailability Factor:** 0.3%  
**Total Off-line Time:** -14 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	708.1	644.5	709.9	684.3	704.7	675.5	691.7	693.4	670.5	699.4	671.7	701.8	8255.5
<b>EAF (%)</b>	99.8	97.0	100.0	100.0	100.0	99.6	100.0	99.4	100.0	100.0	100.0	100.0	99.7
<b>UCF (%)</b>	99.8	97.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8
<b>LF (%)</b>	100.8	101.6	101.1	100.8	100.3	99.4	98.5	98.7	98.6	99.4	98.8	99.9	99.8
<b>OF (%)</b>	100.0	102.1	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.2
<b>EUF (%)</b>	0.2	3.0	0.0	0.0	0.0	0.4	0.0	0.6	0.0	0.0	0.0	0.0	0.3
<b>PUF (%)</b>	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>UCLF (%)</b>	0.1	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
<b>XUF (%)</b>	0.0	0.7	0.0	0.0	0.0	0.3	0.0	0.6	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1.CN2 WAS BASICALLY OPERATED IN BASE-LOAD MODE.2.THERE WAS NO SCRAM IN 2008.3. CN2 WAS DELOADED FOR 1.43 DAYS DUE TO THE POWER GRID FAILURE AND AXIAL POWER DEVIATION OF THE REACTOR.4.CN2 DECREASED TO 760MW AT THE REQUEST OF POWER GRID DURING TYPHOON FOR TWO TIMES IN 2008.

### 5. Historical Summary

**Date of Construction Start:** 07 Aug 1987  
**Date of First Criticality:** 28 Jul 1993  
**Date of Grid Connection:** 31 Aug 1993  
**Date of Commercial Operation:** 01 Feb 1994

**Lifetime Generation:** 101352.4 GW(e).h  
**Cumulative Energy Availability Factor:** 82.5%  
**Cumulative Load Factor:** 82.7%  
**Cumulative Unit Capability Factor:** 86.8%  
**Cumulative Energy Unavailability Factor:** 17.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1994	5808.2	944.0	77.4	77.4	76.3	76.3	76.8	76.8	6385	79.7
1995	3723.6	944.0	84.6	81.2	46.2	60.6	45.0	60.2	4088	46.7
1996	6252.7	944.0	76.8	79.7	76.0	65.9	75.4	65.4	6847	77.9
1997	6491.2	944.0	82.1	80.3	74.6	68.1	78.5	68.8	7272	83.0
1998	6040.5	944.0	79.6	80.1	72.0	68.9	73.0	69.6	7344	83.8
1999	6723.7	944.0	87.7	81.4	82.7	71.2	81.3	71.6	7680	87.7
2000	6986.6	944.0	85.4	82.0	85.2	73.3	84.3	73.4	7641	87.0
2001	7009.3	944.0	87.5	82.7	84.8	74.7	84.8	74.9	7619	87.0
2002	7387.2	944.0	89.6	83.5	89.5	76.4	89.3	76.5	7924	90.5
2003	7400.8	944.0	90.9	84.2	90.4	77.8	89.5	77.8	7958	90.8
2004	7540.9	944.0	88.5	84.6	88.2	78.7	90.9	79.0	7789	88.7
2005	8260.5	944.0	100.0	85.9	100.0	80.5	99.9	80.8	8760	100.0
2006	6635.1	944.0	79.9	85.4	79.9	80.5	80.2	80.7	7133	81.4
2007	7542.1	944.0	91.2	85.8	91.2	81.2	91.2	81.5	8074	92.2
2008	8255.5	944.0	99.8	86.8	99.7	82.5	99.8	82.7	8774	100.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1994 to 2008 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	920					
D. Inspection, maintenance or repair without refuelling	19					
E. Testing of plant systems or component:					0	
J. Grid limitation, failure or grid unavailability		34				18
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						205
Subtotal	0	34	0	939	139	223
Total		34			1301	

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

System	2008 Hours Lost	1994 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		11
13. Reactor Auxiliary System:		6
15. Reactor Cooling System:		0
31. Turbine and auxiliaries:		1
32. Feedwater and Main Steam System		20
33. Circulating Water System:		3
41. Main Generator System:		64
42. Electrical Power Supply System:		30
Total	0	135

## CN-3 GUANGDONG-2

**Operator:** GNPJVC (GUANDONG NUCLEAR POWER JOINT VENTURE COMPANY LIMITED(GNPJVC))

**Contractor:** GEC (GENERAL ELECTRIC COMPANY (UK))

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7174.4 GW(e).h  
**Energy Availability Factor:** 86.2%  
**Load Factor:** 86.8%  
**Operating Factor:** 87.5%  
**Energy Unavailability Factor:** 13.8%  
**Total Off-line Time:** 1093 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	709.7	664.7	710.5	684.2	705.2	679.4	312.3	692.8	674.7	700.9	1.4	638.5	7174.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	45.2	99.0	100.0	100.0	0.2	90.1	86.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	45.2	99.0	100.0	100.0	0.2	90.1	86.2
<b>LF (%)</b>	101.0	104.8	101.2	100.8	100.4	100.0	44.5	98.6	99.3	99.7	0.2	90.9	86.8
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	47.2	100.0	100.0	99.9	0.7	98.8	87.5
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	54.8	1.0	0.0	0.0	99.8	9.9	13.8
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	99.8	9.9	9.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	54.8	1.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1.CN3 WAS BASICALLY OPERATED IN BASE-LOAD MODE.2.ON JULY 14, CN3 AUTOMATICALLY SHUT DOWN AS A RESULT OF THE MISTAKEN ACTUATION OF THE T-ZONE DIFFERENTIAL PROTECTION DEVICE AT THE HIGH VOLTAGE SIDE OF THE MAIN TRANSFORMER, WHICH WAS FOLLOWED BY THE TEMPERATURE REGULATING CONTROL ROD DEVIATION EVENT. AFTER 16.39 DAY'S EMERGENCY MAINTENANCE, THE UNIT WAS FINALLY CONNECTED TO THE POWER GRID ON JULY 31.3.CN3 WAS BEARING ITS THIRTEEN REFUELLING OUTAGE FROM NOV.1 TO DEC.1, LASTING 30.46 DAYS.

### 5. Historical Summary

**Date of Construction Start:** 07 Apr 1988  
**Date of First Criticality:** 21 Jan 1994  
**Date of Grid Connection:** 07 Feb 1994  
**Date of Commercial Operation:** 07 May 1994

**Lifetime Generation:** 98733.8 GW(e).h  
**Cumulative Energy Availability Factor:** 81.9%  
**Cumulative Load Factor:** 81.8%  
**Cumulative Unit Capability Factor:** 83.9%  
**Cumulative Energy Unavailability Factor:** 18.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1994	5014.2	944.0	99.4	99.4	92.3	92.3	90.3	90.3	5761	98.0
1995	6343.3	944.0	81.1	88.4	77.5	83.4	76.7	82.2	7146	81.6
1996	5276.9	944.0	67.4	80.6	63.9	76.1	63.6	75.2	5740	65.3
1997	5914.8	944.0	70.1	77.7	67.4	73.8	71.5	74.2	6194	70.7
1998	6259.1	944.0	82.9	78.8	74.7	74.0	75.7	74.5	7302	83.4
1999	6789.5	944.0	86.2	80.1	83.3	75.6	82.1	75.9	7594	86.7
2000	6995.5	944.0	89.1	81.5	88.4	77.5	84.4	77.1	7840	89.3
2001	7355.5	944.0	91.1	82.7	89.5	79.1	88.9	78.7	7986	91.2
2002	6728.9	944.0	82.2	82.7	81.6	79.4	81.4	79.0	7224	82.5
2003	6983.1	944.0	84.6	82.9	84.5	79.9	84.4	79.6	7503	85.7
2004	6358.9	944.0	74.4	82.1	74.2	79.4	76.7	79.3	6580	74.9
2005	6587.0	944.0	79.6	81.9	79.6	79.4	79.7	79.3	7075	80.8
2006	8222.8	944.0	99.9	83.3	99.9	81.0	99.4	80.9	8760	100.0
2007	7344.2	944.0	88.8	83.7	88.8	81.6	88.8	81.5	7858	89.7
2008	7174.4	944.0	86.2	83.9	86.2	81.9	86.8	81.8	7667	87.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1994 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		412			154	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	725			914		
D. Inspection, maintenance or repair without refuelling				18		
J. Grid limitation, failure or grid unavailability						22
L. Human factor related					23	
Subtotal	725	412	0	932	181	22
Total		1137			1135	

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

System	2008 Hours Lost	1994 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		8
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		72
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		2
35. All other I&C Systems		2
41. Main Generator System		63
42. Electrical Power Supply System	412	0
Total	412	151

# CN-6 LINGAO 1

**Operator:** LANPC (LINGAO NUCLEAR POWER COMPANY LTD.)

**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 938.0 MW(e)  
**Design Net Capacity:** 938.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

## 2. Production Summary 2008

**Net Energy Production:** 7542.9 GW(e).h  
**Energy Availability Factor:** 91.2%  
**Load Factor:** 91.8%  
**Operating Factor:** 93.2%  
**Energy Unavailability Factor:** 8.8%  
**Total Off-line Time:** 597 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	690.9	657.1	213.7	516.4	694.4	678.1	702.9	700.4	671.4	699.4	617.1	701.2	7542.9
<b>EAF (%)</b>	99.9	100.0	29.3	78.0	98.5	99.6	100.0	100.0	99.5	100.0	90.9	99.2	91.2
<b>UCF (%)</b>	99.9	100.0	29.3	78.0	100.0	99.9	100.0	100.0	100.0	100.0	99.8	99.2	92.1
<b>LF (%)</b>	99.0	104.2	30.6	76.6	99.5	100.4	100.7	100.4	99.4	100.1	91.4	100.5	91.8
<b>OF (%)</b>	100.0	103.6	29.7	86.5	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	93.2
<b>EUF (%)</b>	0.1	0.0	70.7	22.0	1.5	0.4	0.0	0.0	0.5	0.0	9.1	0.8	8.8
<b>PUF (%)</b>	0.1	0.0	70.7	22.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	7.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8	0.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.5	0.3	0.0	0.0	0.4	0.0	8.9	0.0	0.9

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

1.CN6 WAS BASICALLY OPERATED IN BASE-LOAD MODE.2.THERE WAS NO SCRAM IN 2008.3.BY THE REQUEST OF GRID SYSTEM, CN6 WAS DELOADED AROUND 535.96 HOURS IN 2008.4.CN6WAS BEARING ITS SIXTH REFUELLING OUTAGE FROM MAR.10 TO APR.5, LASTING 25.92DAYS.

## 5. Historical Summary

**Date of Construction Start:** 15 May 1997 **Lifetime Generation:** 46988.3 GW(e).h  
**Date of First Criticality:** 04 Feb 2002 **Cumulative Energy Availability Factor:** 87.2%  
**Date of Grid Connection:** 26 Feb 2002 **Cumulative Load Factor:** 85.7%  
**Date of Commercial Operation:** 28 May 2002 **Cumulative Unit Capability Factor:** 87.7%  
**Cumulative Energy Unavailability Factor:** 12.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2002	4583.8	938.0	95.7	95.7	95.7	95.7	83.1	83.1	5184	88.1
2003	6375.0	938.0	82.3	87.7	80.4	86.5	77.6	79.8	7215	82.4
2004	7331.4	938.0	89.0	88.2	88.7	87.3	89.0	83.2	7884	89.8
2005	6906.4	938.0	84.3	87.1	84.3	86.5	84.1	83.5	7424	84.7
2006	7401.0	938.0	90.1	87.7	90.1	87.3	90.1	84.9	7964	90.9
2007	6835.0	938.0	83.2	86.9	83.2	86.6	83.2	84.6	7345	83.8
2008	7542.9	938.0	92.1	87.7	91.2	87.2	91.8	85.7	8163	93.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2003 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure C. Inspection, maintenance or repair combined with refuelling	622			815	182	
Subtotal	622	0	0	815	182	0
Total	622			997		

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

System	2008 Hours Lost	2003 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems:		4
15. Reactor Cooling System:		96
42. Electrical Power Supply System:		82
Total	0	182

## CN-7 LINGAO 2

Operator: LANPC (LINGAO NUCLEAR POWER COMPANY LTD.)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 938.0 MW(e)  
 Design Net Capacity: 938.0 MW(e)  
 Design Discharge Burnup: —  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 7077.1 GW(e).h  
 Energy Availability Factor: 85.2%  
 Load Factor: 86.1%  
 Operating Factor: 86.5%  
 Energy Unavailability Factor: 14.8%  
 Total Off-line Time: 1183 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	310.6	337.6	700.3	682.0	707.4	682.1	704.8	701.3	676.9	701.4	682.1	190.5	7077.1
EAF (%)	45.5	51.8	99.1	100.0	100.0	100.0	100.0	99.9	100.0	99.9	99.8	25.2	85.2
UCF (%)	45.5	51.8	99.1	100.0	100.0	100.0	100.0	99.9	100.0	99.9	99.8	25.2	85.2
LF (%)	44.5	53.6	100.3	101.1	101.4	101.0	101.0	100.5	100.2	100.4	101.0	27.3	86.1
OF (%)	45.7	65.5	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	26.5	86.5
EUF (%)	54.5	48.2	0.9	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	74.8	14.8
PUF (%)	54.5	47.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.8	14.6
UCLF (%)	0.0	0.7	0.9	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.1	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. 2008 Summary of Operation

1.CN7 WAS BASICALLY OPERATED IN BASE-LOAD MODE.2.THERE WAS NO SCRAM IN 2008.3.CN7 WAS BEARING ITS FIFTH REFUELING OUTAGE FROM JAN.15 TO FEB.11, LASTING 27.49DAYS DAYS, AND ITS SIXTH REFUELING OUTAGE FROM DEC.9 TO JAN.11 IN 2009, LASTING 33.49 DAYS.

### 5. Historical Summary

Date of Construction Start: 28 Nov 1997      Lifetime Generation: 43148.7 GW(e).h  
 Date of First Criticality: 27 Aug 2002      Cumulative Energy Availability Factor: 87.7%  
 Date of Grid Connection: 15 Dec 2002      Cumulative Load Factor: 87.4%  
 Date of Commercial Operation: 08 Jan 2003      Cumulative Unit Capability Factor: 87.8%  
    Cumulative Energy Unavailability Factor: 12.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2003	6934.9	938.0	90.6	90.6	89.9	89.9	84.4	84.4	7494	85.5
2004	6669.4	938.0	79.9	85.2	79.8	84.9	80.9	82.7	7109	80.9
2005	7530.9	938.0	91.6	87.3	91.3	87.0	91.7	85.7	8075	92.2
2006	7661.0	938.0	92.1	88.5	92.1	88.3	93.2	87.6	8164	93.2
2007	7215.1	938.0	87.8	88.4	87.8	88.2	87.8	87.6	7796	89.0
2008	7077.1	938.0	85.2	87.8	85.2	87.7	86.1	87.4	7577	86.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2003 to 2008 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	1211			720		
L. Human factor related					0	
Subtotal	1211	0	0	720	62	0
Total	1211			782		

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

System	2008 Hours Lost	2003 to 2008 Average Hours Lost Per Year
32. Feedwater and Main Steam System		7
41. Main Generator System		54
Total	0	61



# CN-1 QINSHAN 1

Operator: QNPC (QINSHAN NUCLEAR POWER COMPANY)

Contractor: CNNC (CHINA NATIONAL NUCLEAR CORPORATION)

## 1. Station Details

Type: PWR

Net Reference Unit Power at the beginning of 2008: 288.0 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 2008

Net Energy Production: 2430.7 GW(e).h

Energy Availability Factor: 95.4%

Load Factor: 96.3%

Operating Factor: 96.3%

Energy Unavailability Factor: 4.6%

Total Off-line Time: 326 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	119.3	187.9	218.4	211.1	217.4	205.7	212.8	211.2	206.3	215.5	209.0	216.1	2430.7
EAF (%)	55.1	91.9	100.0	100.0	99.8	98.0	100.0	99.9	100.0	100.0	99.9	100.0	95.4
UCF (%)	55.2	92.0	100.0	100.0	99.8	100.0	100.0	99.9	100.0	100.0	99.9	100.0	95.5
LF (%)	55.7	97.1	101.9	102.0	101.4	99.2	99.3	98.6	99.5	100.5	100.8	100.9	96.3
OF (%)	59.8	96.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	96.3
EUf (%)	44.9	8.1	0.0	0.0	0.2	2.0	0.0	0.1	0.0	0.0	0.1	0.0	4.6
PUf (%)	17.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.1	0.0	1.5
UCLF (%)	27.9	8.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	3.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

AT 13:45 12TH JAN.2008,THE UNIT WAS CONNECTED TO GRID AFTER 10TH REFUELING OUTAGE AND OPERATED AT FULL POWER SINCE 21:25 15TH JAN.2008. THE 10TH OUTAGE HAS EXTENDED FOR 175.75 HOURS. FULL POWER OPERATION DURATION IS 356 DAYS AND 8 HOURS. &#61656;AT 13:45 12TH JAN.2008,THE UNIT SYNCHRONIZED THE GRID AFTER 10TH REFUELING OUTAGE AND OPERATED AT FULL POWER SINCE 21:25 15TH JAN.2008. THE 10TH OUTAGE HAS EXTENDED FOR 175.75 HOURS.&#61656;AT 23:30 16TH JAN, UNIT DISCONNECTED GRID TO DEAL WITH LEAKAGE ON SECONDARY EJECTOR TUBE.&#61656;AT 0:20 5TH FEB, BECAUSE OF THE LEAKAGE ON PRESSURE DIFFERENCE TRANSMITTER OF PRESSURIZER SPRAYER, UNIT WAS SHUT DOWN MANUALLY, WHICH BACK TO ITS FULL POWER OPERATION AT 8:05 7TH FEB. AT 23:48 6TH FEB, WHEN UNIT POWER WAS INCREASED TO 50MWE, A REACTOR SCRAM RESULTED FROM HIGH-HIGH LEVEL OF SG A WAS EXPERIENCED. &#61656;FROM 5:00 24TH JUNE TO 22:25 27TH JUNE, THE POWER OF THE UNIT DECREASED TO 260MWE FOR GRID 220KV TRANSMITION MODIFICATION.

## 5. Historical Summary

Date of Construction Start: 20 Mar 1985      Lifetime Generation: 31325.7 GW(e).h

Date of First Criticality: 31 Oct 1991      Cumulative Energy Availability Factor: 77.3%

Date of Grid Connection: 15 Dec 1991      Cumulative Load Factor: 78.4%

Date of Commercial Operation: 01 Apr 1994      Cumulative Unit Capability Factor: 79.0%

   Cumulative Energy Unavailability Factor: 22.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1994	1153.9	279.0	67.5	67.5	62.0	62.0	62.7	62.7	4624	70.1
1995	2063.9	300.0	86.8	78.8	82.3	74.0	78.5	72.0	7886	90.0
1996	2073.7	279.0	81.2	79.7	81.2	76.5	84.6	76.5	7479	85.1
1997	2011.7	300.0	81.8	80.2	76.1	76.4	76.5	76.5	7185	82.0
1998	1149.5	279.0	48.8	73.8	42.6	69.5	47.0	70.5	4331	49.4
1999	680.9	279.0	27.8	66.0	27.8	62.4	27.9	63.3	2519	28.8
2000	2035.5	300.0	77.6	67.8	77.6	64.8	77.2	65.4	6840	77.9
2001	2319.4	279.0	93.5	71.0	92.8	68.3	94.9	69.1	8370	95.5
2002	1783.2	279.0	69.2	70.8	66.3	68.1	73.0	69.5	5989	68.4
2003	2256.6	288.0	88.5	72.6	88.4	70.2	89.4	71.6	7798	89.0
2004	2565.2	288.0	99.8	75.2	99.1	72.9	101.4	74.4	8784	100.0
2005	2194.6	288.0	87.0	76.2	86.8	74.1	87.0	75.5	7693	87.8
2006	2310.4	288.0	91.8	77.4	91.8	75.5	91.6	76.7	8086	92.3
2007	2061.4	288.0	82.2	77.8	82.0	75.9	81.7	77.1	7218	82.4
2008	2430.7	288.0	95.5	79.0	95.4	77.3	96.3	78.4	8434	96.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1993 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		72			41	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	102			1083		
D. Inspection, maintenance or repair without refuelling				77		
E. Testing of plant systems or component:					2	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					387	2
L. Human factor related		180				
Subtotal	102	252	0	1160	436	2
Total		354			1598	

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

System	2008 Hours Lost	1993 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	47	3
13. Reactor Auxiliary Systems		5
15. Reactor Cooling Systems		0
31. Turbine and auxiliaries	25	4
32. Feedwater and Main Steam System		15
33. Circulating Water System		4
35. All other I&C Systems		2
41. Main Generator Systems		2
XX. Miscellaneous Systems		2
Total	72	37

## 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**  
**at the beginning of 2008:** 610.0 MW(e)  
**Design Net Capacity:** 610.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 4677.6 GW(e).h  
**Energy Availability Factor:** 85.2%  
**Load Factor:** 87.5%  
**Operating Factor:** 86.2%  
**Energy Unavailability Factor:** 14.8%  
**Total Off-line Time:** 1206 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	474.7	436.0	471.9	458.2	471.0	452.4	451.2	441.3	439.8	207.0	0.0	374.0	4677.6
<b>EAF (%)</b>	100.0	98.7	99.3	99.7	100.0	100.0	100.0	98.9	100.0	45.4	0.0	80.6	85.2
<b>UCF (%)</b>	100.0	100.0	99.3	99.7	100.0	100.0	100.0	98.9	100.0	45.4	0.0	80.6	85.3
<b>LF (%)</b>	104.6	106.4	104.0	104.5	103.8	103.0	99.4	97.2	100.1	45.6	0.0	82.4	87.5
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	45.4	0.0	86.0	86.2
<b>EUf (%)</b>	0.0	1.3	0.7	0.3	0.0	0.0	0.0	1.1	0.0	54.6	100.0	19.4	14.8
<b>PUf (%)</b>	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	54.6	100.0	15.5	14.2
<b>UCLF (%)</b>	0.0	0.0	0.7	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	3.9	0.5
<b>XUF (%)</b>	0.0	1.3	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. 2008 Summary of Operation

THERE IS NO UNPLANNED AUTOMATIC SCRAM;FROM 2008-2-5 TO 2008-2-9 LOAD FOLLOWING, OPERATING AT 580MWE FOR GRID DEMAND;FROM 2008-3-15 01:05 TO 2008-3-15 13:23 UNPLANNED POWER LOSS DUE TO THE WELDING LINE CRAZE OF GPV SYSTEM;FROM 2008-8-23 12:00 TO 2008-8-23 11:00 UNPLANNED POWER LOSS DUE TO THE HIGH TEMPERATURE OF THRUST AXLE TREE OF CRF PUMP;FROM 2008-10-15 TO 2008-12-9, MAINTENANCE WITH REFUELING;

### 5. Historical Summary

**Date of Construction Start:** 02 Jun 1996 **Lifetime Generation:** 28032.8 GW(e).h  
**Date of First Criticality:** 15 Nov 2001 **Cumulative Energy Availability Factor:** 76.7%  
**Date of Grid Connection:** 06 Feb 2002 **Cumulative Load Factor:** 76.9%  
**Date of Commercial Operation:** 18 Apr 2002 **Cumulative Unit Capability Factor:** 76.7%  
**Cumulative Energy Unavailability Factor:** 23.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2002	2965.3	610.0	81.6	81.6	81.6	81.6	73.6	73.6	4631	70.2
2003	4327.3	610.0	81.0	81.2	80.9	81.2	81.0	77.8	7123	81.3
2004	4395.7	610.0	80.1	80.8	80.1	80.8	82.0	79.4	7117	81.0
2005	4944.8	610.0	90.6	83.4	90.6	83.4	92.5	82.9	7982	91.1
2006	2938.2	610.0	55.2	77.5	55.2	77.5	55.0	77.0	4890	55.8
2007	3503.0	610.0	64.1	75.2	64.1	75.2	65.6	75.0	5681	64.9
2008	4677.6	610.0	85.3	76.7	85.2	76.7	87.5	76.9	7554	86.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2003 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		29			179	
C. Inspection, maintenance or repair combined with refuelling	1200			974		
D. Inspection, maintenance or repair without refuelling				17		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				655		
Z. Others					24	
Subtotal	1200	29	0	1646	203	0
Total		1229			1849	

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

System	2008 Hours Lost	2003 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		120
21. Fuel Handling and Storage Facilities	29	
31. Turbine and auxiliaries:		25
32. Feedwater and Main Steam System		0
41. Main Generator System:		33
Total	29	178

## 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**  
**at the beginning of 2008:** 610.0 MW(e)  
**Design Net Capacity:** 610.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 4635.5 GW(e).h  
**Energy Availability Factor:** 84.9%  
**Load Factor:** 86.7%  
**Operating Factor:** 86.1%  
**Energy Unavailability Factor:** 15.1%  
**Total Off-line Time:** 1215 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	472.6	434.7	473.2	457.7	290.1	3.6	388.9	447.2	440.9	454.3	445.0	327.3	4635.5
<b>EAF (%)</b>	100.0	98.7	100.0	100.0	61.5	0.9	86.9	100.0	100.0	99.9	100.0	70.4	84.9
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	61.5	0.9	89.5	100.0	100.0	99.9	100.0	70.4	85.2
<b>LF (%)</b>	104.1	106.0	104.3	104.4	63.9	0.8	85.7	98.5	100.4	100.0	101.3	72.1	86.7
<b>OF (%)</b>	100.0	103.6	100.0	100.1	61.8	3.2	94.5	100.0	100.0	99.9	100.0	70.8	86.1
<b>EUf (%)</b>	0.0	1.3	0.0	0.0	38.5	99.1	13.1	0.0	0.0	0.1	0.0	29.6	15.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	38.5	99.1	6.9	0.0	0.0	0.0	0.0	29.6	14.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.1	0.0	0.0	0.3
<b>XUF (%)</b>	0.0	1.3	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

FROM 2008-2-5 TO 2008-2-9 LOAD FOLLOWING, OPERATING AT 580MWE FOR GRID DEMAND FROM 2008-5-20 TO 2008-7-6, MAINTENANCE WITH REFUELING. FROM 2008-7-9 TO 2008-7-10, UNPLANNED TURBINE SHUTDOWN TO DEAL WITH THE DISFIGUREMENT OF TURBINE BYPASS SYSTEM (GCT). THERE IS ONE UNPLANNED AUTOMATIC SCRAM DUE TO THE LIGHTNING STRIKE AT 2008-07-11 16:32. FROM 2008-10-30 4:40 TO 12:50, UNPLANNED POWER LOSS DUE TO THE HUB MALFUNCTION OF DCS. FROM 2008-12-12 TO 2008-12-21, PLANNED OUTAGE TO DEAL WITH THE SECOND SEAL LEAKAGE OF PRIMARY PUMP.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1997 **Lifetime Generation:** 22528.9 GW(e).h  
**Date of First Criticality:** 25 Feb 2004 **Cumulative Energy Availability Factor:** 87.6%  
**Date of Grid Connection:** 11 Mar 2004 **Cumulative Load Factor:** 89.3%  
**Date of Commercial Operation:** 03 May 2004 **Cumulative Unit Capability Factor:** 87.7%  
**Cumulative Energy Unavailability Factor:** 12.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2004	3514.3	610.0	96.2	96.2	96.2	96.2	98.0	98.0	5682	96.6
2005	4521.5	610.0	82.8	88.2	82.7	88.1	84.6	90.0	7331	83.7
2006	4790.4	610.0	88.8	88.4	88.8	88.4	89.6	89.9	7822	89.3
2007	4817.0	610.0	88.3	88.4	88.3	88.4	90.1	89.9	7792	88.9
2008	4635.5	610.0	85.2	87.7	84.9	87.6	86.7	89.3	7545	86.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2004 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		23			29	
C. Inspection, maintenance or repair combined with refuelling	982			661		
D. Inspection, maintenance or repair without refuelling	216			33		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			17			
Subtotal	1198	23	17	694	29	0
Total	1238			723		

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

System	2008 Hours Lost	2004 to 2008 Average Hours Lost Per Year
17. Safety I&C Systems (excluding reactor I&C)	23	
31. Turbine and auxiliaries		22
32. Feedwater and Main Steam System		1
42. Electrical Power Supply System		5
Total	23	28

## 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**  
**at the beginning of 2008:** 650.0 MW(e)  
**Design Net Capacity:** 650.0 MW(e)  
**Design Discharge Burnup:** 7186 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 5328.6 GW(e).h  
**Energy Availability Factor:** 91.1%  
**Load Factor:** 93.6%  
**Operating Factor:** 91.9%  
**Energy Unavailability Factor:** 8.9%  
**Total Off-line Time:** 709 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	456.6	462.9	503.0	487.3	499.4	161.5	475.2	477.6	468.6	495.5	485.7	355.4	5328.6
<b>EAF (%)</b>	90.9	98.6	100.0	100.0	100.0	33.7	99.0	100.0	100.0	100.0	100.0	70.7	91.1
<b>UCF (%)</b>	90.9	100.0	100.0	100.0	100.0	33.7	99.0	100.0	100.0	100.0	100.0	70.7	91.2
<b>LF (%)</b>	94.4	106.0	104.0	104.3	103.3	34.5	98.3	98.8	100.1	102.3	103.8	73.5	93.6
<b>OF (%)</b>	93.5	103.6	100.0	100.1	100.0	34.7	100.0	100.0	100.0	99.9	100.0	71.1	91.9
<b>EUF (%)</b>	9.1	1.4	0.0	0.0	0.0	66.3	1.0	0.0	0.0	0.0	0.0	29.3	8.9
<b>PUF (%)</b>	9.1	0.0	0.0	0.0	0.0	66.3	1.0	0.0	0.0	0.0	0.0	29.3	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>	0.0	1.4	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. 2008 Summary of Operation

1. THE UNIT CONNECTED TO GRID IN JANUARY 2 AND FINALLY REACHED FULL POWER OPERATION IN JANUARY 4 AFTER THE OUTAGE. 2. AS PER THE GRID ARRANGEMENT, THE UNIT POWER WAS DROPPED AND OPERATED AT 88% FROM 03:15 OF FEBRUARY 6TH TO 08:25 OF FEBRUARY 9TH. 3. AT 01:00 ON JUNE 11, THE UNIT DISCONNECTED TO REPAIR FEEDER GRAYLOCS SEAL LEAKING, AND FINALLY REACHED FULL POWER OPERATION AT 09:10 ON JULY 2. 4. AT 20:00 OF DEC. 22, THE UNIT BEGAN TO LOWER POWER AND DISCONNECTED FROM THE GRID AT 1:06 OF DEC. 23 FOR THE 4TH PLANNED MAINTENANCE OUTAGE OF THE UNIT.

### 5. Historical Summary

**Date of Construction Start:** 08 Jun 1998 **Lifetime Generation:** 30608.4 GW(e).h  
**Date of First Criticality:** 21 Sep 2002 **Cumulative Energy Availability Factor:** 86.4%  
**Date of Grid Connection:** 19 Nov 2002 **Cumulative Load Factor:** 88.6%  
**Date of Commercial Operation:** 31 Dec 2002 **Cumulative Unit Capability Factor:** 86.9%  
**Cumulative Energy Unavailability Factor:** 13.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2002			Data not provided							
2003	5174.7	650.0	89.7	89.7	86.6	86.6	90.9	90.9	7977	91.1
2004	4405.5	650.0	75.6	82.6	75.6	81.1	77.2	84.0	6745	76.8
2005	4781.6	650.0	82.5	82.6	82.4	81.5	84.0	84.0	7249	82.8
2006	5577.8	650.0	96.3	86.0	96.3	85.2	98.0	87.5	8484	96.8
2007	5020.4	650.0	86.4	86.1	86.4	85.5	88.2	87.6	7597	86.7
2008	5328.6	650.0	91.2	86.9	91.1	86.4	93.6	88.6	8051	91.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2003 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure D. Inspection, maintenance or repair without refuelling	742			783	172	
Subtotal	742	0	0	783	172	0
Total	742			955		

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

System	2008 Hours Lost	2003 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		22
15. Reactor Cooling System:		49
32. Feedwater and Main Steam System		6
42. Electrical Power Supply System:		82
Total	0	171



## 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**  
**at the beginning of 2008:** 650.0 MW(e)  
**Design Net Capacity:** 650.0 MW(e)  
**Design Discharge Burnup:** 7186 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 5083.4 GW(e).h  
**Energy Availability Factor:** 87.2%  
**Load Factor:** 89.3%  
**Operating Factor:** 87.9%  
**Energy Unavailability Factor:** 12.8%  
**Total Off-line Time:** 1063 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	503.0	462.4	502.4	274.4	1.7	468.1	480.2	478.2	469.2	496.2	486.7	461.0	5083.4
<b>EAF (%)</b>	100.0	98.6	100.0	56.4	0.8	96.9	100.0	100.0	100.0	100.0	100.0	94.7	87.2
<b>UCF (%)</b>	100.0	100.0	100.0	56.4	0.8	96.9	100.0	100.0	100.0	100.0	100.0	94.7	87.3
<b>LF (%)</b>	104.0	105.9	103.9	58.7	0.3	100.0	99.3	98.9	100.2	102.5	104.0	95.3	89.3
<b>OF (%)</b>	100.0	103.6	100.0	57.0	3.0	100.0	100.0	100.0	100.0	99.9	100.0	92.6	87.9
<b>EUF (%)</b>	0.0	1.4	0.0	43.6	99.2	3.1	0.0	0.0	0.0	0.0	0.0	5.3	12.8
<b>PUF (%)</b>	0.0	0.0	0.0	43.6	99.2	2.7	0.0	0.0	0.0	0.0	0.0	0.0	12.2
<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	5.3	0.5
<b>XUF (%)</b>	0.0	1.4	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. 2008 Summary of Operation

1. AS PER THE GRID ARRANGEMENT, THE UNIT POWER WAS DROPDOWNED AND OPERATED AT 88% FROM 04:22 OF FEBRUARY 6TH TO 08:15 OF FEBRUARY 9TH. 2. ON APRIL 18, THE UNIT WAS SHUTDOWN FOR PLANNED MAINTENANCE OUTAGE. AT 01:55 ON MAY 31, THE UNIT CONNECTED TO GRID, AND REACHED FULL POWER OPERATION AT 17:30 ON JUNE 2. 3. AT 3:06 OF DEC 4, THE UNIT EXPERIENCED A SETBACK ON LOW DEAERATOR LEVEL AND SUBSEQUENTLY POISONED-OUT BECAUSE CONDENSATE PURIFICATION BYPASS FLOW CONTROL VALVE 4324-FCV6010 FAILED CLOSED. AT 9:48 OF DECEMBER 6, THE UNIT RE-CONNECTED TO GRID.

### 5. Historical Summary

**Date of Construction Start:** 25 Sep 1998 **Lifetime Generation:** 27877.3 GW(e).h  
**Date of First Criticality:** 18 Jan 2003 **Cumulative Energy Availability Factor:** 88.8%  
**Date of Grid Connection:** 12 Jun 2003 **Cumulative Load Factor:** 89.6%  
**Date of Commercial Operation:** 24 Jul 2003 **Cumulative Unit Capability Factor:** 88.9%  
**Cumulative Energy Unavailability Factor:** 11.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2003			Data not provided							
2004	5358.6	665.0	93.0	93.0	92.4	92.4	91.7	91.7	8236	93.8
2005	4604.6	665.0	80.2	86.6	80.1	86.3	79.0	85.4	7014	80.1
2006	5038.2	650.0	86.7	86.7	86.7	86.4	88.5	86.4	7721	88.1
2007	5675.7	650.0	97.6	89.3	97.6	89.2	99.7	89.7	8559	97.7
2008	5083.4	650.0	87.3	88.9	87.2	88.8	89.3	89.6	7697	87.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2004 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure D. Inspection, maintenance or repair without refuelling L. Human factor related N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)	1037	69		657	26 18	9
Subtotal	1037	69	0	657	44	9
Total		1106			710	

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

System	2008 Hours Lost	2004 to 2008 Average Hours Lost Per Year
16. Steam generation system:		10
32. Feedwater and Main Steam System	69	
42. Electrical Power Supply System:		15
Total	69	25

# CN-10 TIANWAN 1

Operator: JNPC (Jiangsu Nuclear Power Corporation)

Contractor: IZ (Izhorskiye Zavody)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 933.0 MW(e)  
 Design Net Capacity: 933.0 MW(e)  
 Design Discharge Burnup: —  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 6116.2 GW(e).h  
 Energy Availability Factor: 71.0%  
 Load Factor: 74.6%  
 Operating Factor: 71.4%  
 Energy Unavailability Factor: 29.0%  
 Total Off-line Time: 2514 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	0.0	438.2	715.9	733.5	698.6	719.8	597.7	30.2	732.3	712.8	737.2	6116.2
EAF (%)	0.0	0.0	60.4	100.0	100.0	100.0	100.0	83.0	4.4	100.0	100.0	100.0	71.0
UCF (%)	0.0	0.0	60.4	100.0	100.0	100.0	100.0	83.0	4.4	100.0	100.0	100.0	71.0
LF (%)	0.0	0.0	63.1	106.6	105.7	104.0	103.7	86.1	4.5	105.5	106.1	106.2	74.6
OF (%)	0.0	0.0	63.8	100.0	100.0	100.0	100.0	83.1	5.7	100.0	100.0	100.0	71.4
EUAF (%)	100.0	100.0	39.6	0.0	0.0	0.0	0.0	17.0	95.6	0.0	0.0	0.0	29.0
PUF (%)	100.0	100.0	39.6	0.0	0.0	0.0	0.0	0.0	80.8	0.0	0.0	0.0	26.4
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	14.8	0.0	0.0	0.0	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. 2008 Summary of Operation

1. AT 4:39 ON MARCH 12, 2008, UNIT 1 OF TIANWAN NPP SYNCHRONIZED THE GRID AFTER T101 OUTAGE. 2. AT 17:32 ON AUGUST 26, 2008, THE MAIN TRANSFORMER ON THE 1ST PHASE B WAS FAULT. THEN PROTECTION DEVICE MOVED, UNIT 1 AUTOMATIC SAFETY SHUTDOWN. AT THIS TIME, THE FIRST MINOR OUTAGE BEGINS. AT 7:07 ON SEPTEMBER 29, 2008, UNIT 1 OF TIANWAN NPP SYNCHRONIZED THE GRID AFTER THE FIRST MINOR OUTAGE.

## 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: 12662.0 GW(e).h  
 Cumulative Energy Availability Factor: 76.5%  
 Cumulative Load Factor: 79.0%  
 Cumulative Unit Capability Factor: 76.5%  
 Cumulative Energy Unavailability Factor: 23.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2007	4687.0	1000.0	84.7	84.7	84.7	84.7	85.4	85.4	4955	84.3
2008	6116.2	933.0	71.0	76.5	71.0	76.5	74.6	79.0	6270	71.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2007 to 2008 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	1709			432		
D. Inspection, maintenance or repair without refuelling	573					
Subtotal	2282	233	0	432	0	0
Total		2515			432	

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

System	2008 Hours Lost	2007 to 2008 Average Hours Lost Per Year
42. Electrical Power Supply System:	233	
Total	233	0

## CN-11 TIANWAN 2

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

**Contractor:** IZ (Izhorskiye Zavody)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power at the beginning of 2008:** 933.0 MW(e)  
**Design Net Capacity:** 933.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 7003.0 GW(e).h  
**Energy Availability Factor:** 81.1%  
**Load Factor:** 85.7%  
**Operating Factor:** 82.1%  
**Energy Unavailability Factor:** 18.9%  
**Total Off-line Time:** 1567 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	736.2	681.7	725.9	712.6	0.1	0.0	574.6	724.2	700.4	700.8	708.9	737.6	7003.0
<b>EAFF (%)</b>	100.0	100.0	99.7	99.3	0.0	0.0	79.8	100.0	100.0	96.1	99.9	100.0	81.1
<b>UCF (%)</b>	100.0	100.0	99.7	99.3	0.0	0.0	79.8	100.0	100.0	96.1	99.9	100.0	81.1
<b>LF (%)</b>	106.1	108.7	104.6	106.2	0.0	0.0	82.8	104.3	104.3	100.8	105.5	106.3	85.7
<b>OF (%)</b>	100.0	103.6	100.0	100.1	0.1	0.0	82.8	100.0	100.0	99.9	100.0	100.0	82.1
<b>EUAF (%)</b>	0.0	0.0	0.3	0.7	100.0	100.0	20.2	0.0	0.0	3.9	0.1	0.0	18.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.7	100.0	100.0	20.2	0.0	0.0	3.9	0.1	0.0	18.8
<b>UCLF (%)</b>	0.0	0.0	0.3	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. 2008 Summary of Operation

AT 0:35 ON MAY 1, 2008&#65292;UNIT 2 SHUTDOWN DURING REFUELING OUTAGE.AT 7:41 ON JULY 6, 2008&#65292;UNIT 2 OF TIANWAN NPP SYNCHRONIZED THE GRID AFTER OUTAGE.

### 5. Historical Summary

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

**Lifetime Generation:** 10977.0 GW(e).h  
**Cumulative Energy Availability Factor:** 86.7%  
**Cumulative Load Factor:** 90.2%  
**Cumulative Unit Capability Factor:** 86.7%  
**Cumulative Energy Unavailability Factor:** 13.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2007	3459.0	958.0	100.0	100.0	100.0	100.0	101.0	101.0	3586	97.7
2008	7003.0	933.0	81.1	86.7	81.1	86.7	85.7	90.2	7193	82.1

### 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2008 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	1607					
Subtotal	1607	0	0	0	0	0
Total	1607			0		

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

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

There were no equipment related outages reported for this period.

## TW-1 CHIN SHAN-1

**Operator:** TPC (TAI POWER CO.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3998.9 GW(e).h  
**Energy Availability Factor:** 75.4%  
**Load Factor:** 75.4%  
**Operating Factor:** 77.7%  
**Energy Unavailability Factor:** 24.6%  
**Total Off-line Time:** 1962 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	448.6	420.4	448.3	434.9	418.8	434.2	447.8	448.4	422.2	12.5	0.0	62.8	3998.9
<b>EAF (%)</b>	99.8	100.0	99.8	100.0	93.2	99.8	99.6	99.8	97.1	2.8	0.0	14.0	75.4
<b>UCF (%)</b>	99.8	100.0	99.8	100.0	93.2	99.8	100.0	99.8	99.1	2.8	0.0	14.0	75.6
<b>LF (%)</b>	99.8	100.0	99.8	100.0	93.2	99.8	99.6	99.8	97.1	2.8	0.0	14.0	75.4
<b>OF (%)</b>	100.0	100.0	100.0	100.0	93.4	100.0	100.0	100.0	100.0	2.8	0.0	36.8	77.7
<b>EUF (%)</b>	0.2	0.0	0.2	0.0	6.8	0.2	0.4	0.2	2.9	97.2	100.0	86.0	24.6
<b>PUF (%)</b>	0.2	0.0	0.2	0.0	0.0	0.2	0.0	0.1	0.9	97.2	100.0	29.7	19.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.1	0.0	0.0	0.0	56.3	5.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	2.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. UNIT SHUTDOWN FOR MAIN TRANSFORMER REPAIR ON MAY.09,2008.2.POWER RESTRICTION DUE TO TYPHOON ON SEP.28,2008.3.EOC-23 REFUELING OUTAGE DURING OCT.01 TILL DEC.10,2008.4.OUTAGE EXTENSION TO MAINTAIN GENERATOR COIL ON DEC.10,2008.5.GENERATOR & TURBINE TRIPPED DUE TO RELAY(46G) ON DEC.19,2008.6.POWER RESTRICTION DUE TO RFM OF GENERATOR HIGH INDICATION ON DEC.21,2008.

## 5. Historical Summary

<b>Date of Construction Start:</b>	02 Jun 1972	<b>Lifetime Generation:</b>	126857.2 GW(e).h
<b>Date of First Criticality:</b>	16 Oct 1977	<b>Cumulative Energy Availability Factor:</b>	81.8%
<b>Date of Grid Connection:</b>	16 Nov 1977	<b>Cumulative Load Factor:</b>	81.2%
<b>Date of Commercial Operation:</b>	10 Dec 1978	<b>Cumulative Unit Capability Factor:</b>	82.9%
		<b>Cumulative Energy Unavailability Factor:</b>	18.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		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	604.0	55.3	55.3	55.3	55.3	52.6	52.6	5226	59.7
1990	2968.5	591.0	55.4	55.3	54.8	55.1	57.3	54.9	5315	60.7
1991	4391.4	604.0	83.9	64.9	82.0	64.1	83.0	64.4	7602	86.8
1992	4017.7	604.0	77.6	68.1	76.6	67.3	75.7	67.2	7260	82.7
1993	4424.0	604.0	86.5	71.8	83.0	70.4	83.6	70.5	7854	89.7
1994	3645.4	604.0	69.4	71.4	67.7	70.0	68.9	70.2	6458	73.7
1995	4154.3	604.0	81.0	72.8	80.5	71.5	78.5	71.4	7168	81.8
1996	4070.9	604.0	81.8	73.9	78.6	72.4	76.7	72.1	7051	80.3
1997	4990.5	604.0	96.4	76.4	96.2	75.0	94.3	74.6	8558	97.7
1998	4295.1	604.0	85.2	77.3	83.5	75.9	81.2	75.2	7448	85.0
1999	4081.1	604.0	81.2	77.7	78.8	76.1	77.1	75.4	7156	81.7
2000	5226.1	604.0	99.8	79.5	99.2	78.1	98.5	77.3	8784	100.0
2001	4319.7	604.0	82.1	79.7	81.5	78.3	81.6	77.7	7282	83.1
2002	4376.0	604.0	83.5	80.0	83.4	78.7	82.7	78.0	7367	84.1
2003	5240.0	604.0	99.6	81.3	99.4	80.1	99.0	79.4	8760	100.0
2004	4541.9	604.0	86.4	81.6	85.8	80.4	85.6	79.8	7646	87.0
2005	4573.8	604.0	87.9	82.0	86.8	80.8	86.4	80.2	7745	88.4
2006	5201.8	604.0	99.5	83.0	99.5	81.8	98.3	81.2	8760	100.0
2007	4607.9	604.0	88.8	83.3	88.2	82.2	87.1	81.5	7834	89.4
2008	3998.9	604.0	75.6	82.9	75.4	81.8	75.4	81.2	6822	77.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		298			172	
B. Refuelling without a maintenance				96		
C. Inspection, maintenance or repair combined with refuelling	1659			916		
D. Inspection, maintenance or repair without refuelling				35		
E. Testing of plant systems or component:	5			0	10	
H. Nuclear regulatory requirement						1
J. Grid limitation, failure or grid unavailability						7
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						15
Subtotal	1664	298	0	1047	182	23
Total		1962			1252	

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		2
14. Safety Systems		56
15. Reactor Cooling System:		42
31. Turbine and auxiliaries		32
32. Feedwater and Main Steam System		3
41. Main Generator System:	232	0
42. Electrical Power Supply System:	65	36
Total	297	171

## TW-2 CHIN SHAN-2

Operator: TPC (TAI POWER CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 4422.4 GW(e).h  
 Energy Availability Factor: 83.3%  
 Load Factor: 83.6%  
 Operating Factor: 84.2%  
 Energy Unavailability Factor: 16.7%  
 Total Off-line Time: 1385 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	449.4	419.9	26.3	114.3	445.5	326.5	441.4	447.0	423.0	445.4	434.5	449.4	4422.4
EAF (%)	100.0	99.9	5.9	26.2	99.1	75.1	98.2	99.5	97.3	99.1	99.9	100.0	83.3
UCF (%)	100.0	99.9	5.9	26.2	99.2	75.1	98.7	99.5	99.4	99.1	99.9	100.0	83.5
LF (%)	100.0	103.4	5.9	26.3	99.1	75.1	98.2	99.5	97.3	99.0	99.9	100.0	83.6
OF (%)	100.0	103.6	5.9	26.4	100.0	75.1	100.0	100.0	100.0	99.9	100.0	100.0	84.2
EUF (%)	0.0	0.1	94.1	73.8	0.9	24.9	1.8	0.5	2.7	0.9	0.1	0.0	16.7
PUF (%)	0.0	0.1	94.1	22.1	0.8	24.9	0.0	0.5	0.6	0.8	0.1	0.0	12.1
UCLF (%)	0.0	0.0	0.0	51.8	0.1	0.0	1.4	0.0	0.0	0.1	0.0	0.0	4.4
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	2.1	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1.EOC-22 REFUELING OUTAGE DURING MAR.02 TILL APR.07,2008. 2.OUTAGE EXTENSION TO REPAIR SEALING OIL LEAKAGE OF EXCITER BEARING ON APR.08,2008. 3.UNIT SHUTDOWN TO REPAIR SEALING OIL SYSTEM OF MAIN GENERATOR ON JUN.21,2008. 4.POWER RESTRICTION DUE TO TYPHOON ON SEP.28,2008.



## 5. Historical Summary

<b>Date of Construction Start:</b>	07 Dec 1973	<b>Lifetime Generation:</b>	125493.2 GW(e).h
<b>Date of First Criticality:</b>	09 Nov 1978	<b>Cumulative Energy Availability Factor:</b>	81.5%
<b>Date of Grid Connection:</b>	19 Dec 1978	<b>Cumulative Load Factor:</b>	81.5%
<b>Date of Commercial Operation:</b>	15 Jul 1979	<b>Cumulative Unit Capability Factor:</b>	82.6%
		<b>Cumulative Energy Unavailability Factor:</b>	18.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		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	604.0	59.3	59.3	59.3	59.3	57.8	57.8	6010	68.6
1990	3436.8	593.0	65.4	62.3	64.8	62.1	66.2	62.0	6242	71.3
1991	3783.5	604.0	72.5	65.8	70.1	64.8	71.5	65.2	6847	78.2
1992	4129.2	604.0	79.1	69.1	78.5	68.2	77.8	68.3	7326	83.4
1993	3934.9	604.0	76.7	70.6	73.1	69.2	74.4	69.6	6992	79.8
1994	3979.5	604.0	78.8	72.0	76.6	70.4	75.2	70.5	7001	79.9
1995	3885.7	604.0	77.5	72.8	75.9	71.2	73.4	70.9	6808	77.7
1996	4001.5	604.0	78.0	73.4	77.5	72.0	75.4	71.5	6897	78.5
1997	4325.5	604.0	80.6	74.2	80.1	72.9	81.8	72.6	7168	81.8
1998	4841.5	604.0	96.0	76.4	94.7	75.1	91.5	74.5	8422	96.1
1999	4296.3	604.0	82.6	77.0	80.7	75.6	81.2	75.1	7274	83.0
2000	4596.5	604.0	85.9	77.7	85.3	76.4	86.6	76.1	7584	86.3
2001	5018.1	604.0	95.0	79.0	93.9	77.8	94.8	77.5	8515	97.2
2002	4290.4	604.0	80.6	79.2	80.5	77.9	81.1	77.8	7414	84.6
2003	4574.5	604.0	86.5	79.6	86.0	78.5	86.5	78.4	7595	86.7
2004	5247.6	604.0	98.6	80.8	98.0	79.7	98.9	79.7	8704	99.1
2005	4530.5	604.0	86.3	81.2	85.2	80.0	85.6	80.0	7641	87.2
2006	4650.8	604.0	88.4	81.6	87.5	80.4	87.9	80.4	7812	89.2
2007	5218.8	604.0	99.6	82.5	98.3	81.4	98.6	81.4	8654	98.8
2008	4422.4	604.0	83.5	82.6	83.3	81.5	83.6	81.5	7375	84.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					185	
B. Refuelling without a maintenance outage				89	9	
C. Inspection, maintenance or repair combined with refuelling	854	372		880		
D. Inspection, maintenance or repair without refuelling	179			53		
E. Testing of plant systems or component	3			1		
H. Nuclear regulatory requirement						1
J. Grid limitation, failure or grid unavailability						5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						5
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						5
Subtotal	1036	372	0	1023	194	16
Total		1408			1233	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		1
14. Safety Systems		1
15. Reactor Cooling System		59
21. Fuel Handling and Storage Facilities		7
31. Turbine and auxiliaries		44
32. Feedwater and Main Steam System		16
33. Circulating Water System		10
41. Main Generator System		26
42. Electrical Power Supply System		11
Total	0	181

## TW-3 KUOSHENG-1

Operator: TPC (TAI POWER CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 985.0 MW(e)  
 Design Net Capacity: 985.0 MW(e)  
 Design Discharge Burnup: —  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 8384.8 GW(e).h  
 Energy Availability Factor: 96.9%  
 Load Factor: 97.2%  
 Operating Factor: 99.0%  
 Energy Unavailability Factor: 3.1%  
 Total Off-line Time: 87 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	734.1	677.5	623.6	703.5	729.7	690.0	724.0	711.3	681.4	724.9	691.5	693.5	8384.8
EAF (%)	100.0	98.8	85.1	99.2	99.6	97.3	98.8	97.1	96.1	98.9	97.5	94.6	96.9
UCF (%)	100.0	99.2	85.1	99.6	100.0	98.7	100.0	98.9	100.0	100.0	98.8	95.7	98.0
LF (%)	100.2	102.4	85.1	99.3	99.6	97.3	98.8	97.1	96.1	98.8	97.5	94.6	97.2
OF (%)	100.0	103.6	87.1	100.1	100.0	100.0	100.0	100.0	99.2	99.9	100.0	98.8	99.0
EUF (%)	0.0	1.2	14.9	0.8	0.4	2.7	1.2	2.9	3.9	1.1	2.5	5.4	3.1
PUF (%)	0.0	0.9	0.0	0.4	0.0	0.8	0.0	0.9	0.0	0.0	1.2	0.0	0.4
UCLF (%)	0.0	0.0	14.9	0.0	0.0	0.5	0.0	0.2	0.0	0.0	0.0	4.3	1.7
XUF (%)	0.0	0.4	0.0	0.4	0.4	1.4	1.2	1.9	3.9	1.1	1.3	1.1	1.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1.MAR.24-MAR.28 RX SCRAMMED DUE TO GENERATOR TRIP IN CASE OF AVR FAILURE. 2.SEP.28-SEP.30 TURBINE/GENERATOR MANUAL TRIPED DUE TO TYPHOON INVADE. 3.DEC.07-DEC.09 RX HOT STANDBY FOR MAINTENANCE OF ABS OF SWYD BUS. 4.DEC.20-DEC.22 POWER REDUCED FOR MAINTENANCE OF MSL LEAKAGE.KS UNIT 1 KEPT POWER OPERATING EXCEPT FOR THESE EVENTS ABOVE. KS1 MADE THE ANNUAL HIGHEST GENERATED ELECTRIC POWER RECORD IN 2008.

## 5. Historical Summary

<b>Date of Construction Start:</b>	19 Nov 1975	<b>Lifetime Generation:</b>	177245.3 GW(e).h
<b>Date of First Criticality:</b>	01 Feb 1981	<b>Cumulative Energy Availability Factor:</b>	82.4%
<b>Date of Grid Connection:</b>	21 May 1981	<b>Cumulative Load Factor:</b>	81.2%
<b>Date of Commercial Operation:</b>	28 Dec 1981	<b>Cumulative Unit Capability Factor:</b>	83.1%
		<b>Cumulative Energy Unavailability Factor:</b>	17.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		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	951.0	64.9	64.9	63.0	63.0	64.0	64.0	6447	73.6
1990	6898.0	918.0	87.4	76.0	86.8	74.7	85.8	74.7	8201	93.6
1991	5850.8	951.0	71.4	74.4	71.4	73.6	70.2	73.2	6678	76.2
1992	6152.4	951.0	78.4	75.4	78.4	74.8	73.6	73.3	7126	81.1
1993	5679.5	951.0	71.1	74.6	71.1	74.0	68.2	72.3	6457	73.7
1994	6302.3	950.0	77.8	75.1	76.9	74.5	75.7	72.8	7077	80.8
1995	6897.9	948.0	84.7	76.5	84.6	76.0	83.1	74.3	7734	88.3
1996	6950.8	948.0	84.8	77.5	84.3	77.0	83.5	75.5	7573	86.2
1997	6277.8	948.0	77.7	77.5	77.5	77.1	75.6	75.5	6978	79.7
1998	6426.0	948.0	81.2	77.9	79.7	77.3	77.4	75.7	7209	82.3
1999	7686.8	948.0	95.1	79.5	93.8	78.8	92.6	77.2	8439	96.3
2000	6588.6	948.0	81.3	79.6	80.2	78.9	79.1	77.4	7391	84.1
2001	6452.3	948.0	79.4	79.6	78.8	78.9	77.7	77.4	7070	80.7
2002	8068.5	948.0	98.5	81.0	98.1	80.3	97.2	78.8	8693	99.2
2003	6444.9	948.0	78.5	80.8	78.3	80.2	77.6	78.7	6968	79.5
2004	6978.5	948.0	85.1	81.1	84.7	80.5	83.8	79.0	7516	85.6
2005	8150.1	948.0	99.7	82.2	98.4	81.5	98.1	80.2	8749	99.9
2006	6903.6	948.0	82.6	82.2	81.9	81.5	81.0	80.2	7325	83.6
2007	7104.6	985.0	83.5	82.3	82.3	81.6	82.3	80.3	7429	84.8
2008	8384.8	985.0	98.0	83.1	96.9	82.4	97.2	81.2	8673	99.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		105		5	137	
B. Refuelling without a maintenance				86	12	
C. Inspection, maintenance or repair combined with refuelling				938		
D. Inspection, maintenance or repair without refuelling				78		
E. Testing of plant systems or component				10		
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						6
L. Human factor related					3	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			6			0
Subtotal	0	105	6	1117	152	8
Total		111			1277	

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		3
15. Reactor Cooling Systems		5
21. Fuel Handling and Storage Facilities		19
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		41
33. Circulating Water System		11
35. All other I&C Systems		2
41. Main Generator Systems	96	12
42. Electrical Power Supply Systems	9	9
Total	105	138

## TW-4 KUOSHENG-2

Operator: TPC (TAI POWER CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 948.0 MW(e)  
 Design Net Capacity: 951.0 MW(e)  
 Design Discharge Burnup: —  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 7305.0 GW(e).h  
 Energy Availability Factor: 87.7%  
 Load Factor: 88.0%  
 Operating Factor: 91.7%  
 Energy Unavailability Factor: 12.3%  
 Total Off-line Time: 731 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	687.6	652.9	698.0	664.9	691.4	620.8	681.0	678.9	642.1	678.2	277.1	332.1	7305.0
EAF (%)	97.5	98.9	99.0	97.4	98.0	90.9	96.6	96.3	94.1	96.2	40.6	47.1	87.7
UCF (%)	98.9	99.9	100.0	99.1	100.0	93.3	99.9	99.7	99.2	99.1	41.7	48.0	89.9
LF (%)	97.5	102.5	99.0	97.6	98.0	90.9	96.6	96.3	94.1	96.0	40.6	47.1	88.0
OF (%)	100.0	103.6	100.0	100.1	100.0	97.1	100.0	100.0	100.0	99.9	43.5	56.0	91.7
EUF (%)	2.5	1.1	1.0	2.6	2.0	9.1	3.4	3.7	5.9	3.8	59.4	52.9	12.3
PUF (%)	1.1	0.1	0.1	0.9	0.0	6.7	0.1	0.3	0.8	0.9	58.3	52.0	10.1
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 (%)	1.4	1.0	1.0	1.7	1.9	2.4	3.4	3.4	5.1	2.9	1.1	0.9	2.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1.JUN.06~JUN.10 RX'S IN HOT STANDBY FOR IMPROVING THE PROGRAM OF GENERATOR AVR. (PLANNED)  
 2.NOV.14~DEC.13 EOC-19 REFUELING OUTAGE.(29.45 DAYS) 3.DEC.14~DEC.15 RX'S IN HOT STANDBY FOR TURBINE OVERSPEED TRIP TEST AND WEIGHTING BALANCE. KS UNIT 2 KEPT POWER OPERATING EXCEPT FOR THESE EVENTS ABOVE. KS2 NOT ONLY MADE THE SHORTEST REFUELING OUTAGE (29.45 DAYS)OF NUCLEAR POWER UNIT IN TAIWAN R.O.C , ALSO MADE THE BEST RECORD OF HAVING NO UNPLANNED POWER LOSS IN 2008.

## 5. Historical Summary

<b>Date of Construction Start:</b>	15 Mar 1976	<b>Lifetime Generation:</b>	171110.1 GW(e).h
<b>Date of First Criticality:</b>	26 Mar 1982	<b>Cumulative Energy Availability Factor:</b>	81.7%
<b>Date of Grid Connection:</b>	29 Jun 1982	<b>Cumulative Load Factor:</b>	80.7%
<b>Date of Commercial Operation:</b>	16 Mar 1983	<b>Cumulative Unit Capability Factor:</b>	82.8%
		<b>Cumulative Energy Unavailability Factor:</b>	18.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	Data not provided									
1984	"									
1985	"									
1986	"									
1987	"									
1988	"									
1989	5227.3	951.0	65.3	65.3	61.9	61.9	62.7	62.7	6390	72.9
1990	6000.6	936.0	74.0	69.6	73.5	67.6	73.2	67.9	6819	77.8
1991	7186.3	951.0	89.3	76.2	89.3	74.9	86.3	74.1	8101	92.5
1992	6176.3	951.0	76.8	76.4	76.8	75.4	73.9	74.0	6985	79.5
1993	6138.1	951.0	74.9	76.1	74.9	75.3	73.7	74.0	6921	79.0
1994	6224.1	950.0	76.0	76.1	74.8	75.2	74.8	74.1	6868	78.4
1995	5999.7	948.0	72.9	75.6	72.2	74.8	72.2	73.8	6543	74.7
1996	7423.2	948.0	90.0	77.4	89.6	76.6	89.1	75.8	7978	90.8
1997	7087.2	948.0	88.7	78.7	86.1	77.7	85.3	76.8	7745	88.4
1998	6549.6	948.0	80.3	78.8	79.3	77.8	78.9	77.0	7242	82.7
1999	6831.9	948.0	85.9	79.5	84.2	78.4	82.3	77.5	7544	86.1
2000	7237.6	948.0	91.4	80.5	89.3	79.3	86.9	78.3	8234	93.7
2001	5976.7	948.0	74.1	80.0	72.4	78.8	72.0	77.8	6772	77.3
2002	6922.6	948.0	85.5	80.4	85.1	79.2	83.4	78.2	7530	86.0
2003	7623.1	948.0	93.7	81.3	93.5	80.2	91.8	79.1	8427	96.2
2004	6494.0	948.0	81.3	81.3	79.8	80.2	78.0	79.0	7301	83.1
2005	6737.8	948.0	83.5	81.4	82.3	80.3	81.1	79.2	7424	84.7
2006	7868.4	948.0	96.6	82.2	95.9	81.2	94.7	80.0	8560	97.7
2007	7031.5	948.0	86.7	82.5	86.1	81.4	84.7	80.3	7716	88.1
2008	7305.0	948.0	89.9	82.8	87.7	81.7	88.0	80.7	8029	91.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					126	
B. Refuelling without a maintenance				55	16	
C. Inspection, maintenance or repair combined with refuelling	707			922		
D. Inspection, maintenance or repair without refuelling	48			101		
E. Testing of plant systems or component				20		
J. Grid limitation, failure or grid unavailability					6	3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	14
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Subtotal	755	0	0	1098	149	19
Total	755			1266		

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		4
13. Reactor Auxiliary System:		1
14. Safety Systems		5
15. Reactor Cooling System:		21
21. Fuel Handling and Storage Facilities		32
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		21
33. Circulating Water System		4
35. All other I&C Systems		9
41. Main Generator System:		3
42. Electrical Power Supply System:		4
Total	0	119



## TW-5 MAANSHAN-1

**Operator:** TPC (TAI POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 900.0 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 2008

**Net Energy Production:** 7904.9 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 100.0%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	675.4	631.8	674.1	649.8	669.6	646.3	666.8	666.3	644.2	666.7	645.6	668.4	7904.9
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	99.9	100.0	100.0	99.9	100.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	99.9	100.0
<b>LF (%)</b>	100.9	100.9	100.7	100.3	100.0	99.7	99.6	99.5	99.4	99.6	99.6	99.8	100.0
<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	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	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. 2008 Summary of Operation

1. MAANSHAN UNIT 1 OPERATED AT FULL POWER IN BASE-LOAD OVER THE YEAR EXCEPT OUTAGE, SURVEILLANCE TEST AND SO ON. 2. BASED ON THE STATISTICS, MAANSHAN UNIT 1 RUP IN 2008 WAS 900 MWE.

## 5. Historical Summary

<b>Date of Construction Start:</b>	21 Aug 1978	<b>Lifetime Generation:</b>	149799.4 GW(e).h
<b>Date of First Criticality:</b>	30 Mar 1984	<b>Cumulative Energy Availability Factor:</b>	83.6%
<b>Date of Grid Connection:</b>	09 May 1984	<b>Cumulative Load Factor:</b>	85.0%
<b>Date of Commercial Operation:</b>	27 Jul 1984	<b>Cumulative Unit Capability Factor:</b>	85.1%
		<b>Cumulative Energy Unavailability Factor:</b>	16.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	Data not provided									
1985	"									
1986	"									
1987	"									
1988	"									
1989	5418.4	890.0	66.3	66.3	66.0	66.0	69.5	69.5	6305	72.0
1990	6098.9	894.0	77.8	72.0	76.8	71.4	77.9	73.7	7079	80.8
1991	6479.1	890.0	84.0	76.0	82.7	75.2	83.1	76.8	7368	84.1
1992	6038.8	890.0	76.7	76.2	76.2	75.4	77.2	76.9	6826	77.7
1993	6258.8	890.0	78.5	76.7	78.5	76.0	80.3	77.6	6930	79.1
1994	6322.6	890.0	79.7	77.2	79.6	76.6	81.1	78.2	7098	81.0
1995	6741.1	890.0	84.5	78.2	84.4	77.7	86.5	79.4	7495	85.6
1996	7537.0	890.0	95.8	80.4	93.8	79.7	96.4	81.5	8329	94.8
1997	5949.2	890.0	74.8	79.8	74.3	79.1	76.3	80.9	6752	77.1
1998	5514.5	890.0	69.2	78.7	69.2	78.1	70.7	79.9	6101	69.6
1999	7392.7	890.0	96.3	80.3	92.6	79.5	94.8	81.3	8328	95.1
2000	6729.0	890.0	84.6	80.7	84.3	79.9	86.1	81.7	7502	85.4
2001	5333.3	890.0	86.1	81.1	67.6	78.9	68.4	80.6	6046	69.0
2002	7800.8	890.0	98.8	82.4	98.7	80.3	100.1	82.0	8726	99.6
2003	6751.0	890.0	87.3	82.7	86.2	80.7	86.6	82.3	7579	86.5
2004	6793.7	890.0	87.4	83.0	86.8	81.1	86.9	82.6	7742	88.1
2005	7701.7	890.0	98.1	83.9	98.0	82.1	98.8	83.6	8693	99.2
2006	6763.2	890.0	85.8	84.0	85.8	82.3	86.7	83.7	7599	86.7
2007	7168.2	890.0	90.9	84.3	90.8	82.7	91.9	84.2	8001	91.3
2008	7904.9	900.0	100.0	85.1	100.0	83.6	100.0	85.0	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					196	
B. Refuelling without a maintenance				37	6	
C. Inspection, maintenance or repair combined with refuelling				864	90	
D. Inspection, maintenance or repair without refuelling				7	0	
E. Testing of plant systems or component:				7		
H. Nuclear regulatory requirement					0	
J. Grid limitation, failure or grid unavailability						83
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						9
L. Human factor related					2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
Subtotal	0	0	0	915	294	95
Total	0			1304		

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		12
13. Reactor Auxiliary System:		1
15. Reactor Cooling System:		23
16. Steam generation system:		17
31. Turbine and auxiliaries:		18
32. Feedwater and Main Steam System		8
41. Main Generator System:		78
42. Electrical Power Supply System:		36
Total	0	193

## TW-6 MAANSHAN-2

Operator: TPC (TAI POWER CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 908.0 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 2008

Net Energy Production: 7280.0 GW(e).h  
 Energy Availability Factor: 91.3%  
 Load Factor: 91.3%  
 Operating Factor: 91.5%  
 Energy Unavailability Factor: 8.7%  
 Total Off-line Time: 748 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	675.1	631.7	676.2	367.9	250.2	655.3	676.1	676.4	654.5	676.6	654.1	686.0	7280.0
EAF (%)	99.8	99.9	99.9	57.7	38.3	100.0	99.9	100.0	100.0	100.0	99.9	100.0	91.3
UCF (%)	99.8	99.9	100.0	57.7	38.3	100.0	99.9	100.0	100.0	100.0	99.9	100.0	91.3
LF (%)	99.9	100.0	100.1	56.3	37.0	100.2	100.1	100.1	100.1	100.2	100.1	101.5	91.3
OF (%)	100.0	100.0	100.0	56.8	41.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.5
EUf (%)	0.2	0.1	0.1	42.3	61.7	0.0	0.1	0.0	0.0	0.0	0.1	0.0	8.7
PUf (%)	0.0	0.1	0.1	42.3	61.7	0.0	0.1	0.0	0.0	0.0	0.1	0.0	8.7
UCLF (%)	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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. 2008 Summary of Operation

1. MAANSHAN UNIT 2 OPERATED AT FULL POWER IN BASE-LOAD OVER THE YEAR EXCEPT REFUELING OUTAGE, SURVEILLANCE TEST AND SO ON. 2. BASED ON THE STATISTICS, MAANSHAN UNIT 2 RUP IN 2008 WAS 908 MWE

### 5. Historical Summary

Date of Construction Start: 21 Feb 1979      Lifetime Generation: 152826.2 GW(e).h  
 Date of First Criticality: 01 Feb 1985      Cumulative Energy Availability Factor: 84.0%  
 Date of Grid Connection: 25 Feb 1985      Cumulative Load Factor: 85.8%  
 Date of Commercial Operation: 18 May 1985      Cumulative Unit Capability Factor: 85.8%  
    Cumulative Energy Unavailability Factor: 16.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985			Data not provided							
1986			"							
1987			"							
1988			"							
1989	5283.3	890.0	58.8	58.8	58.1	58.1	67.8	67.8	6434	73.4
1990	6141.3	896.0	78.8	68.9	77.3	67.7	78.2	73.0	7143	81.5
1991	6187.1	890.0	80.4	72.7	78.6	71.3	79.4	75.1	7155	81.7
1992	5956.6	890.0	84.3	75.6	75.5	72.4	76.2	75.4	7541	85.8
1993	6551.0	890.0	84.1	77.3	84.1	74.7	84.0	77.1	7442	85.0
1994	7006.5	890.0	93.3	80.0	88.7	77.0	89.9	79.2	8216	93.8
1995	6118.6	890.0	77.1	79.6	77.1	77.1	78.5	79.1	6947	79.3
1996	6349.8	890.0	81.0	79.7	79.8	77.4	81.2	79.4	7091	80.7
1997	6415.4	890.0	81.6	79.9	81.1	77.8	82.3	79.7	7153	81.7
1998	7781.1	890.0	97.4	81.7	97.2	79.7	99.8	81.7	8557	97.7
1999	6628.4	890.0	85.3	82.0	82.7	80.0	85.0	82.0	7427	84.8
2000	6618.6	890.0	84.1	82.2	82.6	80.2	84.7	82.2	7401	84.3
2001	6993.8	890.0	99.4	83.5	87.3	80.8	89.7	82.8	7729	88.2
2002	6639.8	890.0	82.4	83.4	82.4	80.9	85.2	83.0	7507	85.7
2003	6737.6	890.0	86.6	83.6	85.2	81.2	86.4	83.2	7549	86.2
2004	7883.0	890.0	99.5	84.6	99.5	82.3	100.8	84.3	8784	100.0
2005	6710.0	890.0	85.5	84.7	85.1	82.5	86.1	84.4	7656	87.4
2006	6928.8	890.0	87.7	84.8	87.2	82.8	88.9	84.7	7729	88.2
2007	7829.9	890.0	98.3	85.6	98.3	83.6	100.4	85.5	8631	98.5
2008	7280.0	908.0	91.3	85.8	91.3	84.0	91.3	85.8	8036	91.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					143	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	745			912	3	
D. Inspection, maintenance or repair without refuelling				14		
E. Testing of plant systems or component:	0			1		
J. Grid limitation, failure or grid unavailability						51
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					2	2
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						7
Subtotal	745	0	0	927	149	60
Total	745			1136		

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		17
13. Reactor Auxiliary System		5
15. Reactor Cooling System		36
16. Steam generation system		2
31. Turbine and auxiliaries		22
32. Feedwater and Main Steam System		7
35. All other I&C Systems		6
41. Main Generator System		40
42. Electrical Power Supply System		5
Total	0	140

# CZ-4 DUKOVANY-1

Operator: CEZ (CZECH POWER COMPANY , CEZ a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 427.0 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 2008

Net Energy Production: 3485.3 GW(e).h  
 Energy Availability Factor: 91.6%  
 Load Factor: 93.2%  
 Operating Factor: 92.4%  
 Energy Unavailability Factor: 8.4%  
 Total Off-line Time: 670 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	326.1	304.8	324.1	313.4	318.5	307.1	258.3	316.5	310.0	95.8	283.4	327.4	3485.3
EAF (%)	100.0	100.0	100.0	100.0	99.7	99.7	81.3	99.6	99.8	30.5	89.9	100.0	91.6
UCF (%)	100.0	100.0	100.0	100.0	99.8	100.0	81.7	100.0	100.0	31.5	89.9	100.0	91.8
LF (%)	102.6	106.2	102.0	102.1	100.2	99.9	81.3	99.6	100.8	30.1	92.2	103.1	93.2
OF (%)	100.0	103.6	99.9	100.1	100.0	100.0	82.9	100.0	100.0	31.7	91.9	100.0	92.4
EUf (%)	0.0	0.0	0.0	0.0	0.3	0.3	18.7	0.4	0.2	69.5	10.1	0.0	8.4
PUf (%)	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	68.5	10.1	0.0	6.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	18.3	0.0	0.0	0.0	0.0	0.0	1.6
XUF (%)	0.0	0.0	0.0	0.0	0.1	0.3	0.4	0.4	0.2	1.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

IN 2008, THE YEARLY PRODUCTION OF DUKOVANY NPP SIGNIFICANTLY PASSED THE BENCHMARK OF 14 MILION MWH OF ELECTRICITY. THE OPERATION DUKOVANY NPP WAS SAFE AND RELIABLE. THE UNIT-1 OPERATES WITHOUT SCRAM SINCE 1991.

## 5. Historical Summary

Date of Construction Start: 01 Jan 1979      Lifetime Generation: 71426.4 GW(e).h  
 Date of First Criticality: 12 Feb 1985      Cumulative Energy Availability Factor: 82.7%  
 Date of Grid Connection: 24 Feb 1985      Cumulative Load Factor: 83.8%  
 Date of Commercial Operation: 03 May 1985      Cumulative Unit Capability Factor: 83.6%  
    Cumulative Energy Unavailability Factor: 17.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	1993.9	396.0	88.1	88.1	88.1	88.1	86.7	86.7	5178	88.1
1986	2658.4	403.0	76.1	80.9	76.1	80.8	75.3	79.8	7094	81.0
1987	2575.9	408.0	74.7	78.5	70.7	77.0	72.1	76.9	6867	78.4
1988	2524.0	408.0	74.2	77.3	71.5	75.5	70.4	75.1	6996	79.6
1989	2940.6	408.0	82.6	78.5	82.0	76.9	82.3	76.6	7579	86.5
1990	2965.6	408.0	84.3	79.5	82.5	77.9	83.0	77.8	7658	87.4
1991	2581.1	408.0	70.7	78.2	70.5	76.8	72.2	76.9	6751	77.1
1992	3172.8	408.0	80.9	78.5	80.5	77.3	88.5	78.5	7537	85.8
1993	3239.7	442.0	83.7	79.2	83.7	78.1	83.7	79.1	7649	87.3
1994	3278.5	442.0	84.6	79.8	84.6	78.8	84.7	79.7	7656	87.4
1995	2966.1	442.0	76.8	79.5	76.8	78.6	76.6	79.4	7022	80.2
1996	3144.6	412.0	86.0	80.0	85.4	79.2	86.9	80.0	7592	86.4
1997	3295.6	440.0	86.8	80.6	85.3	79.7	85.5	80.5	7678	87.6
1998	2973.4	412.0	85.4	80.9	82.6	79.9	82.4	80.6	7518	85.8
1999	2901.1	412.0	79.8	80.9	79.2	79.8	80.4	80.6	7034	80.3
2000	3327.9	412.0	89.8	81.4	89.7	80.5	92.0	81.3	7934	90.3
2001	3328.9	412.0	90.6	82.0	90.2	81.0	92.2	82.0	7996	91.3
2002	3267.5	412.0	89.6	82.4	88.9	81.5	90.5	82.5	7926	90.5
2003	3032.0	412.0	82.9	82.4	82.6	81.5	84.0	82.5	7261	82.9
2004	3035.5	412.0	83.6	82.5	82.9	81.6	83.9	82.6	7349	83.7
2005	3324.5	412.0	91.3	82.9	90.6	82.0	92.1	83.1	8015	91.5
2006	3271.6	412.0	91.2	83.3	89.7	82.4	90.6	83.4	8014	91.5
2007	2967.3	427.0	81.4	83.2	80.9	82.3	81.7	83.3	7198	82.2
2008	3485.3	427.0	91.8	83.6	91.6	82.7	93.2	83.8	8090	92.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		127			58	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	567			1098		
D. Inspection, maintenance or repair without refuelling				113		
J. Grid limitation, failure or grid unavailability						5
L. Human factor related					0	
Subtotal	567	127	0	1211	58	5
Total	694			1274		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		4
14. Safety Systems		8
15. Reactor Cooling System:		20
16. Steam generation system:	127	
31. Turbine and auxiliaries		3
41. Main Generator System:		0
42. Electrical Power Supply System:		20
Total	127	55

# CZ-5 DUKOVANY-2

**Operator:** CEZ (CZECH POWER COMPANY , CEZ a.s.)

**Contractor:** SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 412.0 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 2008

**Net Energy Production:** 3040.4 GW(e).h  
**Energy Availability Factor:** 81.5%  
**Load Factor:** 82.2%  
**Operating Factor:** 82.5%  
**Energy Unavailability Factor:** 18.5%  
**Total Off-line Time:** 1532 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	303.7	286.2	61.4	0.0	197.3	303.5	314.6	312.8	309.7	319.3	308.2	323.5	3040.4
<b>EAF (%)</b>	97.8	99.1	20.9	-0.1	63.5	98.6	99.1	98.4	99.7	99.3	99.1	100.0	81.5
<b>UCF (%)</b>	97.8	100.0	22.7	-0.1	63.7	99.2	99.8	99.2	100.0	99.8	99.1	100.0	82.0
<b>LF (%)</b>	99.1	103.4	20.0	0.0	62.1	98.7	99.0	98.4	100.7	100.4	100.2	101.8	82.2
<b>OF (%)</b>	100.0	103.6	22.7	0.0	65.3	99.6	100.0	100.0	100.0	99.9	100.0	100.0	82.5
<b>EUf (%)</b>	2.2	0.9	79.1	100.1	36.5	1.4	0.9	1.6	0.3	0.7	0.9	0.0	18.5
<b>PUF (%)</b>	0.0	0.0	77.3	100.1	36.3	0.0	0.0	0.0	0.0	0.2	0.1	0.0	17.6
<b>UCLF (%)</b>	2.2	0.0	0.0	0.0	0.0	0.8	0.2	0.8	0.0	0.0	0.8	0.0	0.4
<b>XUF (%)</b>	0.0	0.9	1.9	0.0	0.2	0.5	0.7	0.8	0.3	0.5	0.0	0.0	0.5

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

POWER UPRATE. RECONSTRUCTION OF THE LOW-PRESSURE FLOW PARTS OF THE STEAM TURBINE WAS FINISHED AT UNIT 2. NEW TG ROTORS WITH IMPROVED BLADES WILL CUT THE HEAT SPECIFIC CONSUMPTION OF THE TURBINE SYSTEM BY AT LEAST 3.5%.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1979      **Lifetime Generation:** 69334.3 GW(e).h  
**Date of First Criticality:** 23 Jan 1986      **Cumulative Energy Availability Factor:** 83.2%  
**Date of Grid Connection:** 30 Jan 1986      **Cumulative Load Factor:** 84.3%  
**Date of Commercial Operation:** 21 Mar 1986      **Cumulative Unit Capability Factor:** 84.0%  
**Cumulative Energy Unavailability Factor:** 16.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	2693.7	408.0	94.4	94.4	94.4	94.4	89.9	89.9	6906	94.0
1987	2668.6	408.0	76.6	84.7	71.6	82.0	74.7	81.6	6997	79.9
1988	2771.3	408.0	74.9	81.2	74.6	79.4	77.3	80.1	6963	79.3
1989	3011.0	408.0	82.7	81.6	82.2	80.1	84.2	81.2	7713	88.0
1990	2822.7	408.0	80.1	81.3	76.5	79.4	79.0	80.7	7566	86.4
1991	2901.4	408.0	81.6	81.3	81.2	79.7	81.2	80.8	7600	86.8
1992	2830.6	408.0	71.6	79.9	71.4	78.5	79.0	80.5	6551	74.6
1993	3256.9	440.0	84.2	80.5	84.2	79.2	84.5	81.1	7496	85.6
1994	3094.3	440.0	80.8	80.5	79.6	79.3	80.3	81.0	7315	83.5
1995	3263.3	440.0	85.5	81.1	84.3	79.8	84.7	81.4	7720	88.1
1996	2831.0	412.0	78.3	80.8	77.3	79.6	78.2	81.1	6917	78.7
1997	3144.8	440.0	81.1	80.8	81.1	79.7	81.6	81.1	7179	82.0
1998	3209.2	412.0	88.2	81.4	87.7	80.3	88.9	81.7	7803	89.1
1999	3198.1	412.0	88.4	81.9	87.8	80.9	88.6	82.2	7812	89.2
2000	2954.1	412.0	81.8	81.9	81.2	80.9	81.6	82.2	7223	82.2
2001	3121.1	412.0	86.9	82.2	86.4	81.2	86.5	82.4	7646	87.3
2002	3159.6	412.0	88.3	82.6	87.8	81.6	87.5	82.7	7716	88.1
2003	3252.6	412.0	89.8	83.0	89.2	82.0	90.1	83.2	7939	90.6
2004	3087.7	412.0	84.4	83.0	84.2	82.2	85.3	83.3	7439	84.7
2005	3313.2	412.0	91.3	83.5	90.8	82.6	91.8	83.7	8048	91.9
2006	3294.7	412.0	91.1	83.8	90.6	83.0	91.3	84.1	8017	91.5
2007	3274.7	412.0	90.9	84.1	90.1	83.3	90.7	84.4	7983	91.1
2008	3040.4	427.0	82.0	84.0	81.5	83.2	82.2	84.3	7228	82.5



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					43	
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling	1552			1056		
D. Inspection, maintenance or repair without refuelling				79		
J. Grid limitation, failure or grid unavailability					1	3
L. Human factor related		3			0	
Subtotal	1552	3	0	1135	55	3
Total	1555			1193		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		7
15. Reactor Cooling System:		5
16. Steam generation system:		5
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		17
42. Electrical Power Supply System:		4
XX. Miscellaneous Systems		0
Total	0	40

## CZ-8 DUKOVANY-3

Operator: CEZ (CZECH POWER COMPANY , CEZ a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 427.0 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 2008

Net Energy Production: 3548.8 GW(e).h  
 Energy Availability Factor: 93.1%  
 Load Factor: 94.9%  
 Operating Factor: 94.4%  
 Energy Unavailability Factor: 6.9%  
 Total Off-line Time: 487 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	312.9	73.9	325.9	314.2	320.6	305.1	313.4	314.4	309.6	323.4	313.5	322.0	3548.8
EAF (%)	97.6	17.2	100.0	100.0	99.8	99.2	99.0	99.0	99.6	100.0	100.0	99.8	93.1
UCF (%)	100.0	17.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	93.6
LF (%)	98.5	25.7	102.6	102.3	100.9	99.2	98.7	99.0	100.7	101.7	102.0	101.3	94.9
OF (%)	100.0	27.5	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	94.4
EUF (%)	2.4	82.8	0.0	0.0	0.2	0.8	1.0	1.0	0.4	0.0	0.0	0.2	6.9
PUF (%)	0.0	77.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	6.0
UCLF (%)	0.0	4.6	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.4
XUF (%)	2.4	0.3	0.0	0.0	0.2	0.8	1.0	1.0	0.4	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

IN 2008, THE PLANT WAS IN STABLE POWER OPERATION. THERE WAS NO SCRAM IN 2008.

### 5. Historical Summary

Date of Construction Start: 01 Mar 1979      Lifetime Generation: 67697.8 GW(e).h  
 Date of First Criticality: 28 Oct 1986      Cumulative Energy Availability Factor: 83.0%  
 Date of Grid Connection: 14 Nov 1986      Cumulative Load Factor: 84.4%  
 Date of Commercial Operation: 20 Dec 1986      Cumulative Unit Capability Factor: 84.7%  
    Cumulative Energy Unavailability Factor: 17.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	253.0	408.0	100.0	100.0	100.0	100.0	87.6	87.6	744	100.0
1987	3109.9	408.0	86.4	87.4	84.3	85.5	87.0	87.1	7644	87.3
1988	2988.9	408.0	81.4	84.5	80.0	82.8	83.4	85.3	7672	87.3
1989	2685.7	408.0	71.4	80.3	71.0	79.0	75.1	82.0	6678	76.2
1990	2982.0	408.0	85.0	81.4	80.3	79.3	83.4	82.4	7763	88.6
1991	2987.0	408.0	81.6	81.4	81.3	79.7	83.6	82.6	7784	88.9
1992	2917.9	408.0	72.6	80.0	72.3	78.5	81.4	82.4	6678	76.0
1993	3190.5	452.0	80.5	80.1	80.5	78.8	80.6	82.1	7259	82.9
1994	3343.9	452.0	84.5	80.7	84.5	79.6	84.5	82.4	7870	89.8
1995	2689.6	452.0	87.4	81.4	70.0	78.4	67.9	80.7	7788	88.9
1996	2871.2	412.0	80.4	81.3	78.3	78.4	79.3	80.6	7114	81.0
1997	2904.6	440.0	75.5	80.8	74.9	78.1	75.4	80.1	6774	77.3
1998	3090.1	412.0	85.7	81.2	85.0	78.6	85.6	80.5	7564	86.3
1999	3246.2	412.0	89.9	81.8	89.3	79.4	89.9	81.2	7849	89.6
2000	3187.9	412.0	88.7	82.3	87.4	80.0	88.1	81.7	7776	88.5
2001	3006.0	412.0	83.8	82.4	82.7	80.2	83.3	81.8	7309	83.4
2002	3259.4	412.0	89.9	82.9	89.6	80.7	90.3	82.3	7880	90.0
2003	3280.1	412.0	90.5	83.3	89.8	81.3	90.9	82.8	7934	90.6
2004	3302.5	412.0	90.3	83.7	90.2	81.7	91.2	83.3	7957	90.6
2005	2964.9	427.0	80.0	83.5	79.6	81.6	80.2	83.1	7034	80.3
2006	3396.2	427.0	90.8	83.9	90.0	82.1	90.8	83.5	8004	91.4
2007	3427.9	427.0	91.4	84.2	90.9	82.5	91.6	83.9	8068	92.1
2008	3548.8	427.0	93.6	84.7	93.1	83.0	94.9	84.4	8273	94.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		31			84	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	480			1062		
D. Inspection, maintenance or repair without refuelling				30		
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					8	
Subtotal	480	31	0	1092	96	3
Total		511			1191	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	31	
12. Reactor I&C Systems		2
15. Reactor Cooling Systems		34
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		3
35. All other I&C Systems		0
41. Main Generator Systems		36
42. Electrical Power Supply Systems		3
Total	31	81

## CZ-9 DUKOVANY-4

Operator: CEZ (CZECH POWER COMPANY , CEZ a.s.)

Contractor: SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 427.0 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 2008

Net Energy Production: 3438.7 GW(e).h  
 Energy Availability Factor: 90.3%  
 Load Factor: 91.9%  
 Operating Factor: 91.4%  
 Energy Unavailability Factor: 9.7%  
 Total Off-line Time: 750 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	319.2	303.3	326.8	315.1	321.8	307.5	317.7	318.0	312.1	318.4	64.4	214.5	3438.7
EAF (%)	98.1	100.0	100.0	100.0	99.9	99.7	99.7	99.7	99.9	98.9	21.3	66.4	90.3
UCF (%)	98.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	23.8	66.4	90.7
LF (%)	100.5	105.7	102.9	102.6	101.3	100.0	100.0	100.1	101.5	100.1	20.9	67.5	91.9
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	23.9	69.6	91.4
EUF (%)	1.9	0.0	0.0	0.0	0.1	0.3	0.3	0.3	0.1	1.1	78.7	33.6	9.7
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.2	28.9	8.7
UCLF (%)	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.6
XUF (%)	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.3	0.1	1.1	2.5	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

UNIT WAS BASICALLY OPERATED IN BASLOAD MODE. THERE WAS ONE SCRAM DUE TO HUMAN ERROR (CONTROL ROOM PERSONNEL WRONG ACTION) DURING START UP OPERATION.

### 5. Historical Summary

Date of Construction Start: 01 Mar 1979      Lifetime Generation: 66798.3 GW(e).h  
 Date of First Criticality: 01 Jun 1987      Cumulative Energy Availability Factor: 83.8%  
 Date of Grid Connection: 11 Jun 1987      Cumulative Load Factor: 85.6%  
 Date of Commercial Operation: 19 Jul 1987      Cumulative Unit Capability Factor: 84.7%  
    Cumulative Energy Unavailability Factor: 16.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	1596.5	408.0	99.9	99.9	98.2	98.2	88.6	88.6	4117	93.2
1988	2764.0	408.0	74.5	83.0	73.8	82.0	77.1	81.0	7092	80.7
1989	2984.5	408.0	80.8	82.1	80.4	81.3	83.5	82.0	7314	83.5
1990	2995.3	408.0	82.8	82.3	80.0	80.9	83.8	82.5	7836	89.5
1991	2672.0	408.0	78.0	81.3	77.9	80.3	74.8	80.8	7301	83.3
1992	3328.4	408.0	84.5	81.9	83.7	80.9	92.9	83.0	7614	86.7
1993	2939.8	448.0	62.1	78.6	62.1	77.8	74.9	81.6	6859	78.3
1994	3259.8	448.0	84.5	79.5	83.1	78.5	83.1	81.8	7538	86.1
1995	3311.1	448.0	85.5	80.2	85.3	79.4	84.4	82.2	7712	88.0
1996	3202.1	412.0	88.2	81.0	87.1	80.2	88.5	82.8	7762	88.4
1997	3149.2	440.0	80.9	81.0	80.9	80.2	81.7	82.7	7202	82.2
1998	3078.6	412.0	85.7	81.4	83.8	80.5	85.3	82.9	7536	86.0
1999	3179.4	412.0	88.6	82.0	86.6	81.0	88.1	83.3	7792	88.9
2000	3234.5	412.0	89.5	82.5	88.1	81.5	89.4	83.8	7839	89.2
2001	3258.1	412.0	90.4	83.1	89.2	82.1	90.3	84.2	7946	90.7
2002	2748.2	412.0	77.3	82.7	75.6	81.6	76.1	83.7	6745	77.0
2003	3309.8	412.0	91.4	83.2	90.7	82.2	91.7	84.2	8009	91.4
2004	3335.4	412.0	91.1	83.6	90.9	82.7	92.2	84.6	8029	91.4
2005	3267.0	412.0	90.3	84.0	89.6	83.0	90.5	84.9	8008	91.4
2006	3159.5	412.0	87.8	84.2	86.9	83.2	87.5	85.1	7704	87.9
2007	3319.0	427.0	88.7	84.4	88.1	83.5	88.7	85.3	7854	89.7
2008	3438.7	427.0	90.7	84.7	90.3	83.8	91.9	85.6	8010	91.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		9			22	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	752			916		
D. Inspection, maintenance or repair without refuelling				84		
J. Grid limitation, failure or grid unavailability					2	1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						4
L. Human factor related		13				
Subtotal	752	22	0	1000	24	5
Total		774			1029	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		6
15. Reactor Cooling System:		8
32. Feedwater and Main Steam System		4
33. Circulating Water System		0
35. All other I&C Systems		1
42. Electrical Power Supply System:	9	1
Total	9	20

## CZ-23 TEMELIN-1

**Operator:** CEZ (CZECH POWER COMPANY , CEZ a.s.)

**Contractor:** SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 963.0 MW(e)  
**Design Net Capacity:** 963.0 MW(e)  
**Design Discharge Burnup:** 45000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 4526.4 GW(e).h  
**Energy Availability Factor:** 53.4%  
**Load Factor:** 53.7%  
**Operating Factor:** 54.2%  
**Energy Unavailability Factor:** 46.6%  
**Total Off-line Time:** 4015 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	716.2	646.3	431.7	387.3	693.5	685.8	572.9	0.0	0.0	0.0	0.0	392.7	4526.4
<b>EAF (%)</b>	99.9	96.3	60.2	55.6	96.8	99.0	79.9	0.0	0.0	0.1	0.0	55.1	53.4
<b>UCF (%)</b>	99.9	96.3	60.2	55.6	96.9	99.5	80.1	0.0	0.0	0.1	0.0	55.1	53.4
<b>LF (%)</b>	100.0	99.9	60.3	55.9	96.8	98.9	80.0	0.0	0.0	0.0	0.0	54.8	53.7
<b>OF (%)</b>	100.0	100.4	60.9	56.1	97.2	99.9	80.2	0.0	0.0	0.0	0.0	57.9	54.2
<b>EUUF (%)</b>	0.1	3.7	39.8	44.4	3.2	1.0	20.1	100.0	100.0	99.9	100.0	44.9	46.6
<b>PUF (%)</b>	0.0	3.7	0.0	0.0	3.1	0.5	19.9	100.0	100.0	25.8	0.0	2.8	21.4
<b>UCLF (%)</b>	0.1	0.0	39.8	44.4	0.0	0.0	0.0	0.0	0.0	74.1	100.0	42.1	25.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THE PLANNED OUTPUT OF 13 000000 MWH OF ELECTRICITY WAS NOT ACHIEVED OWING TO THE UNPLANNED OUTAGE OF THE TEMELIN 1 WHICH WAS NEEDED IN ORDER TO CARRY OUT THE REPAIR OF THE PRESSURISER GASKET AND FOLLOWING UNPLANNED EXTENSION OUTAGE BY A FAILURE OF A LOW PRESSURE PART OF THE TURBINE.

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1987  
**Date of First Criticality:** 11 Oct 2000  
**Date of Grid Connection:** 21 Dec 2000  
**Date of Commercial Operation:** 10 Jun 2002

**Lifetime Generation:** 38373.6 GW(e).h  
**Cumulative Energy Availability Factor:** 65.7%  
**Cumulative Load Factor:** 66.2%  
**Cumulative Unit Capability Factor:** 65.8%  
**Cumulative Energy Unavailability Factor:** 34.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2002	3675.8	930.0	76.1	76.1	76.1	76.1	77.0	77.0	4233	82.4
2003	5455.3	912.0	65.3	69.3	65.3	69.3	68.3	71.5	5861	66.9
2004	5715.8	950.0	68.1	68.8	68.0	68.8	68.5	70.3	6029	68.6
2005	5444.0	950.0	66.3	68.1	66.3	68.1	66.4	69.2	5846	66.7
2006	6124.9	930.0	75.7	69.8	75.7	69.8	75.2	70.5	6731	76.8
2007	4901.4	963.0	60.0	68.0	60.0	68.0	59.6	68.6	5282	60.3
2008	4526.4	963.0	53.4	65.8	53.4	65.7	53.7	66.2	4745	54.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2001 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1942			765	
C. Inspection, maintenance or repair combined with refuelling	1803			1249		
D. Inspection, maintenance or repair without refuelling				26		
E. Testing of plant systems or component:	43			69		
L. Human factor related		251			152	
S. Fuel management limitation (including high flux tilt, stretch out of coast-down operation)				167		
Subtotal	1846	2193	0	1511	917	0
Total		4039			2428	

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

System	2008 Hours Lost	2001 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		82
12. Reactor I&C Systems		26
15. Reactor Cooling System:	608	49
16. Steam generation system:		29
21. Fuel Handling and Storage Facilities		20
31. Turbine and auxiliaries	1334	399
32. Feedwater and Main Steam System		46
33. Circulating Water System		6
41. Main Generator System:		101
42. Electrical Power Supply System:		3
Total	1942	761

## CZ-24 TEMELIN-2

**Operator:** CEZ (CZECH POWER COMPANY , CEZ a.s.)

**Contractor:** SKODA (SKODA CONCERN NUCLEAR POWER PLANT WORKS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 963.0 MW(e)  
**Design Net Capacity:** 963.0 MW(e)  
**Design Discharge Burnup:** 45000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 6978.7 GW(e).h  
**Energy Availability Factor:** 82.6%  
**Load Factor:** 82.7%  
**Operating Factor:** 84.7%  
**Energy Unavailability Factor:** 17.4%  
**Total Off-line Time:** 1340 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	682.5	660.8	672.1	669.8	135.1	32.7	695.0	715.1	694.2	674.9	657.5	689.2	6978.7
<b>EAF (%)</b>	95.6	98.9	94.3	96.7	19.1	5.7	97.1	99.5	99.9	93.9	94.7	96.3	82.6
<b>UCF (%)</b>	95.6	98.9	96.0	98.2	21.8	5.7	97.5	100.0	100.0	94.0	94.7	96.3	83.2
<b>LF (%)</b>	95.3	102.1	93.8	96.7	18.9	4.7	97.0	99.8	100.1	94.1	94.8	96.2	82.7
<b>OF (%)</b>	96.8	103.6	96.0	100.1	22.2	11.0	98.5	100.0	100.0	96.1	95.0	98.0	84.7
<b>EUF (%)</b>	4.4	1.1	5.7	3.3	80.9	94.3	2.9	0.5	0.1	6.1	5.3	3.7	17.4
<b>PUF (%)</b>	3.6	0.0	0.0	0.0	71.4	94.3	0.8	0.0	0.0	0.0	0.0	0.0	14.2
<b>UCLF (%)</b>	0.8	1.2	4.0	1.8	6.9	0.0	1.7	0.0	0.0	6.0	5.3	3.7	2.6
<b>XUF (%)</b>	0.0	0.0	1.7	1.5	2.7	0.0	0.4	0.4	0.1	0.1	0.0	0.0	0.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THE PLANNED REFUELING OUTAGE ON THE TEMELIN 2 WAS REDUCED BY 3 DAYS.

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1987      **Lifetime Generation:** 36282.3 GW(e).h  
**Date of First Criticality:** 31 May 2002      **Cumulative Energy Availability Factor:** 75.3%  
**Date of Grid Connection:** 29 Dec 2002      **Cumulative Load Factor:** 75.9%  
**Date of Commercial Operation:** 18 Apr 2003      **Cumulative Unit Capability Factor:** 75.5%  
**Cumulative Energy Unavailability Factor:** 24.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2003	5329.8	930.0	84.6	84.6	84.6	84.6	86.8	86.8	5748	87.1
2004	6340.1	950.0	75.2	79.2	75.2	79.2	76.0	80.6	6678	76.0
2005	4941.4	950.0	65.3	74.4	65.1	74.3	65.3	75.3	6135	70.0
2006	5251.9	780.0	65.8	72.1	65.3	71.9	65.4	72.7	5765	65.8
2007	6745.1	963.0	80.1	73.8	79.9	73.7	80.5	74.4	7051	80.5
2008	6978.7	963.0	83.2	75.5	82.6	75.3	82.7	75.9	7420	84.7



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2002 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		119			459	
C. Inspection, maintenance or repair combined with refuelling	1172			904		
D. Inspection, maintenance or repair without refuelling				128		
E. Testing of plant systems or component:	24			45	3	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						0
L. Human factor related		36			76	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			13			
Subtotal	1196	155	13	1077	538	0
Total		1364			1615	

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

System	2008 Hours Lost	2002 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		74
12. Reactor I&C Systems		9
15. Reactor Cooling System:		32
16. Steam generation system:		48
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries:	102	90
32. Feedwater and Main Steam System	17	13
35. All other I&C Systems:		85
41. Main Generator System:		28
42. Electrical Power Supply System:		70
Total	119	454

## 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**  
**at the beginning of 2008:** 488.0 MW(e)  
**Design Net Capacity:** 420.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 3671.8 GW(e).h  
**Energy Availability Factor:** 84.5%  
**Load Factor:** 85.9%  
**Operating Factor:** 86.4%  
**Energy Unavailability Factor:** 15.5%  
**Total Off-line Time:** 1189 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	370.0	345.7	368.9	356.8	366.3	351.8	348.3	69.4	9.5	358.1	356.8	370.1	3671.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	99.7	97.0	16.3	2.6	98.6	100.0	100.0	84.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	99.7	99.7	17.8	2.6	98.6	100.0	100.0	84.8
<b>LF (%)</b>	101.9	105.4	101.6	101.7	100.9	100.1	95.9	19.1	2.7	98.5	101.6	101.9	85.9
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	27.7	6.3	100.0	100.0	100.0	86.4
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.3	3.0	83.7	97.4	1.4	0.0	0.0	15.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.3	82.2	58.8	0.8	0.0	0.0	11.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	38.6	0.6	0.0	0.0	3.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	2.8	1.5	0.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

GOOD PRODUCTION YEAR. OVERALL EXCELLENT SAFETY PERFORMANCE CONTINUED. IAEA OSART FOLLOW-UP REVIEW COMPLETED. 2.-7.6 REPAIR OF LEAKAGE IN HIGH PRESSURE HEATERS. 11.-12.10 STOP OF ONE PCP. REPAIR OF OIL LEAKING.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1971	<b>Lifetime Generation:</b>	109952.6 GW(e).h
<b>Date of First Criticality:</b>	21 Jan 1977	<b>Cumulative Energy Availability Factor:</b>	86.7%
<b>Date of Grid Connection:</b>	08 Feb 1977	<b>Cumulative Load Factor:</b>	86.3%
<b>Date of Commercial Operation:</b>	09 May 1977	<b>Cumulative Unit Capability Factor:</b>	87.1%
		<b>Cumulative Energy Unavailability Factor:</b>	13.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	2118.6	431.0	83.8	83.8	83.8	83.8	83.8	83.8	5591	95.1
1978	2975.8	430.0	78.9	80.9	78.9	80.9	79.0	80.9	7531	86.0
1979	2901.7	405.0	81.8	81.2	81.8	81.2	81.8	81.2	7404	84.5
1980	1407.8	445.0	36.6	68.5	36.6	68.5	36.0	68.4	3482	39.6
1981	3105.1	440.0	81.9	71.5	81.9	71.5	80.6	71.0	7642	87.2
1982	3245.4	440.0	84.2	73.8	84.2	73.8	84.2	73.4	7576	86.5
1983	3337.4	445.0	86.7	75.7	86.7	75.7	85.6	75.3	7982	91.1
1984	3343.9	445.0	85.8	77.1	85.8	77.1	85.5	76.7	7653	87.1
1985	3600.0	440.0	92.5	78.9	92.5	78.9	93.4	78.6	8248	94.2
1986	3522.4	445.0	91.1	80.2	91.1	80.2	90.4	79.8	8093	92.4
1987	3600.4	445.0	94.6	81.5	94.6	81.5	92.4	81.0	8257	94.3
1988	3354.6	445.0	87.0	82.0	87.0	82.0	85.8	81.5	7678	87.4
1989	3575.7	445.0	92.8	82.9	92.6	82.9	91.7	82.3	8183	93.4
1990	3271.1	445.0	85.5	83.1	85.5	83.1	83.9	82.4	7605	86.8
1991	3360.9	445.0	88.8	83.5	88.6	83.4	86.2	82.7	7927	90.5
1992	3108.4	445.0	80.3	83.3	80.2	83.2	79.5	82.5	7186	81.8
1993	3443.2	445.0	89.5	83.6	89.5	83.6	88.4	82.8	8052	92.0
1994	3497.6	445.0	90.8	84.1	90.7	84.0	89.7	83.2	8017	91.5
1995	3389.1	445.0	88.5	84.3	87.7	84.2	86.9	83.4	7834	89.4
1996	3203.5	445.0	82.5	84.2	82.0	84.1	82.0	83.3	7281	82.9
1997	3794.8	445.0	93.9	84.7	93.0	84.5	97.3	84.0	8309	94.9
1998	3852.4	488.0	93.4	85.1	91.3	84.9	90.1	84.3	8234	94.0
1999	3883.3	488.0	92.4	85.5	91.6	85.2	90.8	84.6	8304	94.8
2000	3618.0	488.0	86.5	85.5	84.9	85.2	84.4	84.6	7720	87.9
2001	3921.0	488.0	93.4	85.9	92.4	85.5	91.7	84.9	8233	94.0
2002	3790.1	488.0	91.4	86.1	89.3	85.7	88.7	85.1	8095	92.4
2003	3939.0	488.0	93.2	86.4	92.4	85.9	92.1	85.4	8194	93.5
2004	3715.0	488.0	86.9	86.4	86.5	86.0	86.7	85.4	7647	87.0
2005	4062.4	488.0	95.0	86.7	94.6	86.3	95.0	85.8	8351	95.3
2006	3964.8	488.0	92.6	86.9	92.1	86.5	92.7	86.0	8138	92.9
2007	4028.1	488.0	94.0	87.2	93.5	86.7	94.2	86.3	8285	94.6
2008	3671.8	488.0	84.8	87.1	84.5	86.7	85.9	86.3	7571	86.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					214	
B. Refuelling without a maintenance outage					1	
C. Inspection, maintenance or repair combined with refuelling	936	277		707		
D. Inspection, maintenance or repair without refuelling				18		
E. Testing of plant systems or component				2		
H. Nuclear regulatory requirement				0		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	2	5
Z. Others					8	
Subtotal	936	277	0	727	225	5
Total		1213			957	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		14
14. Safety Systems		4
15. Reactor Cooling System:		164
16. Steam generation system:		2
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		17
32. Feedwater and Main Steam System		7
42. Electrical Power Supply System:		1
Total	0	209

## 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**  
**at the beginning of 2008:** 488.0 MW(e)  
**Design Net Capacity:** 420.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 3998.0 GW(e).h  
**Energy Availability Factor:** 92.5%  
**Load Factor:** 93.5%  
**Operating Factor:** 94.1%  
**Energy Unavailability Factor:** 7.5%  
**Total Off-line Time:** 520 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	370.6	345.9	370.0	357.6	366.6	353.4	360.4	348.5	186.2	211.6	356.5	370.7	3998.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.5	55.5	57.4	100.0	100.0	92.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	64.7	57.4	100.0	100.0	93.5
<b>LF (%)</b>	102.1	105.5	101.9	101.9	101.0	100.6	99.3	96.0	53.0	58.2	101.5	102.1	93.5
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	65.3	60.5	100.0	100.0	94.1
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	44.5	42.6	0.0	0.0	7.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	35.1	40.3	0.0	0.0	6.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.3	0.0	0.0	0.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	9.2	0.0	0.0	0.0	1.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

EXCELLENT PRODUCTION YEAR. FUEL LEAKAGE INDICATION AT LOVIISA 2, SUSPECTED FUEL MANUFACTURING RELATED FAULT. AN INES = 1 CLASSIFIED EVENT NOTICED AND REPORTED AT LOVIISA 2 RELATED TO OUTAGE WORKS. OVERALL EXCELLENT SAFETY PERFORMANCE CONTINUED. IAEA OSART FOLLOW-UP REVIEW COMPLETED.1) [23.7 TRIP OF ONE PCP]2) [10.9 GENERATOR CIRCUIT BREAKER FAULT]

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Aug 1972	<b>Lifetime Generation:</b>	100391.9 GW(e).h
<b>Date of First Criticality:</b>	17 Oct 1980	<b>Cumulative Energy Availability Factor:</b>	88.6%
<b>Date of Grid Connection:</b>	04 Nov 1980	<b>Cumulative Load Factor:</b>	88.4%
<b>Date of Commercial Operation:</b>	05 Jan 1981	<b>Cumulative Unit Capability Factor:</b>	89.3%
		<b>Cumulative Energy Unavailability Factor:</b>	11.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	2714.2	440.0	72.2	72.2	72.2	72.2	70.4	70.4	7062	80.6
1982	2997.4	440.0	78.0	75.1	78.0	75.1	77.8	74.1	7046	80.4
1983	3474.5	445.0	90.1	80.1	90.1	80.1	89.1	79.1	8063	92.0
1984	3608.6	445.0	92.6	83.3	92.6	83.3	92.3	82.5	8251	93.9
1985	3549.8	440.0	92.2	85.0	92.2	85.0	92.1	84.4	8162	93.2
1986	3174.9	445.0	81.5	84.4	81.5	84.4	81.4	83.9	7273	83.0
1987	3572.1	445.0	93.4	85.7	93.4	85.7	91.6	85.0	8242	94.1
1988	3602.3	445.0	94.7	86.8	94.7	86.8	92.2	85.9	8305	94.5
1989	3551.0	445.0	91.8	87.4	91.7	87.4	91.1	86.5	8128	92.8
1990	3251.1	445.0	85.3	87.2	85.3	87.2	83.4	86.2	7584	86.6
1991	3442.2	445.0	89.9	87.4	89.0	87.3	88.3	86.4	7941	90.7
1992	3468.4	445.0	89.5	87.6	89.1	87.5	88.7	86.6	7931	90.3
1993	3550.8	445.0	91.3	87.9	91.2	87.8	91.2	86.9	8050	92.0
1994	3124.7	445.0	81.2	87.4	80.5	87.3	80.2	86.4	7170	81.8
1995	3060.3	445.0	78.4	86.8	77.6	86.6	78.5	85.9	7064	80.6
1996	3621.3	445.0	93.1	87.2	92.7	87.0	92.6	86.3	8227	93.7
1997	3804.7	445.0	92.9	87.5	92.0	87.3	97.6	87.0	8267	94.4
1998	3687.9	488.0	88.6	87.6	86.4	87.2	86.3	86.9	7892	90.1
1999	3974.3	488.0	94.2	88.0	93.5	87.6	93.0	87.3	8281	94.5
2000	3885.1	488.0	94.1	88.3	90.9	87.8	90.6	87.5	8314	94.6
2001	3781.1	488.0	92.3	88.5	89.6	87.9	88.4	87.5	8149	93.0
2002	3498.7	488.0	84.5	88.3	82.6	87.6	81.8	87.2	7463	85.2
2003	3736.7	488.0	90.1	88.4	90.0	87.7	87.4	87.3	8358	95.4
2004	4009.2	488.0	93.6	88.6	93.1	88.0	93.5	87.5	8231	93.7
2005	4076.1	488.0	95.4	88.9	94.5	88.2	95.4	87.9	8376	95.6
2006	3766.6	488.0	88.5	88.9	87.5	88.2	88.1	87.9	7863	89.8
2007	4090.9	488.0	95.5	89.2	94.9	88.5	95.7	88.2	8403	95.9
2008	3998.0	488.0	93.5	89.3	92.5	88.6	93.5	88.4	8240	94.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 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	528			643		
D. Inspection, maintenance or repair without refuelling				41		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				1	2	
Z. Others		17				
Subtotal	528	17	0	685	96	0
Total	545			781		

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		5
14. Safety Systems		5
15. Reactor Cooling System:		41
16. Steam generation system:		2
21. Fuel Handling and Storage Facilities		13
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		16
41. Main Generator System:		0
XX. Miscellaneous Systems		0
Total	0	83

## FI-3 OLKILUOTO-1

**Operator:** TVO (TEOLLISUUDEN VOIMA OY)

**Contractor:** ASEASTAL (ASEA-ATOM / STAL-LAVAL)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 860.0 MW(e)  
**Design Net Capacity:** 660.0 MW(e)  
**Design Discharge Burnup:** 37000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 7066.0 GW(e).h  
**Energy Availability Factor:** 93.1%  
**Load Factor:** 93.8%  
**Operating Factor:** 94.6%  
**Energy Unavailability Factor:** 6.9%  
**Total Off-line Time:** 472 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	647.1	603.7	646.0	622.3	261.3	517.0	624.9	629.6	614.0	638.9	621.1	640.2	7066.0
<b>EAF (%)</b>	100.0	99.7	100.0	99.8	40.9	83.5	98.1	98.5	99.0	99.8	99.8	99.3	93.1
<b>UCF (%)</b>	100.0	99.8	100.0	99.8	41.0	84.6	100.0	99.8	100.0	99.8	99.8	99.3	93.6
<b>LF (%)</b>	101.1	104.5	101.0	100.6	40.8	83.5	97.7	98.4	99.2	99.7	100.3	100.1	93.8
<b>OF (%)</b>	100.0	103.6	99.9	100.1	41.5	91.5	100.0	100.0	100.0	100.0	100.0	100.0	94.6
<b>EUF (%)</b>	0.0	0.3	0.0	0.2	59.1	16.5	1.9	1.5	1.0	0.2	0.2	0.7	6.9
<b>PUF (%)</b>	0.0	0.2	0.0	0.2	50.0	0.0	0.0	0.2	0.0	0.2	0.2	0.0	4.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	9.0	15.4	0.0	0.0	0.0	0.0	0.0	0.7	2.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.1	1.1	1.9	1.3	1.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

NET PRODUCTION WAS 7 066,0 GWH, WHICH IS A GOOD PRODUCTION OUTPUT IN THE OLKILUOTO NUCLEAR POWER PLANT HISTORY. CAPACITY FACTOR WAS 93,7 %. PLANT UNIT HAD AN EXTENSIVE OUTAGE IN MAY THAT TOOK A LITTLE OVER TWO WEEKS (20 DAYS AND 9 HOURS) TO COMPLETE. MAJOR WORKS AT OUTAGE WERE RENOVATION OF MAIN GENERATOR VOLTAGE REGULATOR, OPENING OF TWO LOW PRESSURE TURBINES AND CONTAINMENT PRESSURE TEST.WHEN THE PLANT WAS STARTING AFTER AN ANNUAL OUTAGE, FAULT IN GENERATOR VOLTAGE SYSTEM CAUSE THE GENERATOR AND PLANT BREAKER OPEN AND REACTOR SCRAM.



## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1974  
**Date of First Criticality:** 21 Jul 1978  
**Date of Grid Connection:** 02 Sep 1978  
**Date of Commercial Operation:** 10 Oct 1979

**Lifetime Generation:** 180615.8 GW(e).h  
**Cumulative Energy Availability Factor:** 92.4%  
**Cumulative Load Factor:** 92.1%  
**Cumulative Unit Capability Factor:** 92.7%  
**Cumulative Energy Unavailability Factor:** 7.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	1265.2	660.0	86.9	86.9	86.9	86.9	86.8	86.8	1996	90.4
1980	4280.8	658.0	76.3	78.4	76.3	78.4	74.1	76.6	6849	78.0
1981	4549.2	660.0	80.8	79.5	80.8	79.5	78.7	77.5	7353	83.9
1982	4997.5	658.0	86.7	81.7	86.7	81.7	86.7	80.4	7903	90.2
1983	4808.3	669.0	81.9	81.7	81.9	81.7	82.0	80.7	7651	87.3
1984	5505.6	694.0	91.9	83.8	91.9	83.8	90.3	82.6	8247	93.9
1985	5414.5	710.0	88.8	84.6	88.8	84.6	87.1	83.4	8180	93.4
1986	5463.2	710.0	90.1	85.4	90.1	85.4	87.8	84.0	8008	91.4
1987	5636.5	710.0	92.1	86.2	92.1	86.2	90.6	84.9	8142	92.9
1988	5778.9	710.0	94.3	87.1	94.1	87.1	92.7	85.7	8248	93.9
1989	5056.2	710.0	83.2	86.7	83.2	86.7	81.3	85.3	7278	83.1
1990	5857.3	710.0	95.6	87.5	95.6	87.5	94.2	86.1	8356	95.4
1991	5873.2	710.0	95.7	88.2	94.9	88.1	94.4	86.8	8373	95.6
1992	5803.0	710.0	93.7	88.7	93.2	88.5	93.0	87.3	8251	93.9
1993	5944.9	710.0	95.8	89.2	95.3	89.0	95.6	87.9	8433	96.3
1994	5978.0	710.0	96.5	89.7	96.0	89.5	96.1	88.4	8485	96.9
1995	5931.5	710.0	96.1	90.1	95.5	89.9	95.4	88.9	8427	96.2
1996	5938.6	710.0	92.2	90.2	92.1	90.0	95.2	89.2	8212	93.5
1997	6374.2	772.0	93.9	90.4	93.8	90.2	94.2	89.5	8254	94.2
1998	6807.0	840.0	95.6	90.7	95.0	90.5	92.5	89.7	8384	95.7
1999	7111.8	840.0	97.2	91.1	96.4	90.9	96.6	90.1	8542	97.5
2000	7043.1	840.0	95.8	91.4	95.2	91.1	95.5	90.4	8448	96.2
2001	7163.8	840.0	97.6	91.7	97.2	91.4	97.4	90.8	8561	97.7
2002	6997.5	840.0	95.5	91.9	95.1	91.6	95.1	91.0	8377	95.6
2003	7127.4	840.0	97.1	92.1	96.5	91.8	96.9	91.3	8515	97.2
2004	7009.0	840.0	94.7	92.2	94.7	91.9	95.0	91.4	8329	94.8
2005	7221.1	840.0	97.8	92.5	97.7	92.2	98.1	91.7	8588	98.0
2006	6973.4	840.0	93.3	92.5	92.6	92.2	93.6	91.8	8206	93.7
2007	7334.9	860.0	97.4	92.7	96.7	92.4	97.4	92.0	8554	97.6
2008	7066.0	860.0	93.6	92.7	93.1	92.4	93.8	92.1	8288	94.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1979 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		129			88	
B. Refuelling without a maintenance outage					0	
C. Inspection, maintenance or repair combined with refuelling	368			437		
D. Inspection, maintenance or repair without refuelling				18		
E. Testing of plant systems or component					6	
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					45	0
Z. Others					2	
Subtotal	368	129	0	455	141	3
Total		497			599	

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

System	2008 Hours Lost	1979 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		2
14. Safety Systems		5
15. Reactor Cooling System		12
31. Turbine and auxiliaries	10	20
32. Feedwater and Main Steam System		2
33. Circulating Water System		1
41. Main Generator System	119	36
42. Electrical Power Supply System		0
Total	129	85

## FI-4 OLKILUOTO-2

**Operator:** TVO (TEOLLISUUDEN VOIMA OY)

**Contractor:** ASEASTAL (ASEA-ATOM / STAL-LAVAL)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 860.0 MW(e)  
**Design Net Capacity:** 660.0 MW(e)  
**Design Discharge Burnup:** 37000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 7313.8 GW(e).h  
**Energy Availability Factor:** 96.3%  
**Load Factor:** 97.1%  
**Operating Factor:** 97.9%  
**Energy Unavailability Factor:** 3.7%  
**Total Off-line Time:** 181 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	618.1	604.7	646.2	623.2	465.7	577.9	624.6	629.7	615.3	640.7	623.7	644.2	7313.8
<b>EAF (%)</b>	95.4	99.9	100.0	100.0	73.0	93.2	97.6	98.2	99.0	99.9	100.0	99.7	96.3
<b>UCF (%)</b>	96.7	99.9	100.0	100.0	73.0	94.7	100.0	99.8	100.0	99.9	100.0	99.7	96.9
<b>LF (%)</b>	96.6	104.6	101.0	100.8	72.8	93.3	97.6	98.4	99.4	100.0	100.7	100.7	97.1
<b>OF (%)</b>	97.4	103.6	99.9	100.1	75.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9
<b>EUF (%)</b>	4.6	0.1	0.0	0.0	27.0	6.8	2.4	1.8	1.0	0.1	0.0	0.3	3.7
<b>PUF (%)</b>	0.0	0.1	0.0	0.0	25.5	0.0	0.0	0.1	0.0	0.1	0.0	0.3	2.2
<b>UCLF (%)</b>	3.3	0.0	0.0	0.0	1.5	5.3	0.0	0.1	0.0	0.0	0.0	0.0	0.9
<b>XUF (%)</b>	1.3	0.0	0.0	0.0	0.1	1.5	2.4	1.5	1.0	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

NET PRODUCTION WAS 7 313,8 GWH, CAPACITY FACTOR WAS 96,9%. CAPACITY FACTOR FOR THE UNIT 2 IS THE BEST IN UNIT HISTORY. REFUELLING OUTAGE IN MAY TOOK 7 DAYS AND 18 HOURS TO COMPLETE.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Aug 1975	<b>Lifetime Generation:</b>	171909.8 GW(e).h
<b>Date of First Criticality:</b>	13 Oct 1979	<b>Cumulative Energy Availability Factor:</b>	93.6%
<b>Date of Grid Connection:</b>	18 Feb 1980	<b>Cumulative Load Factor:</b>	93.2%
<b>Date of Commercial Operation:</b>	10 Jul 1982	<b>Cumulative Unit Capability Factor:</b>	94.0%
		<b>Cumulative Energy Unavailability Factor:</b>	6.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1982	2256.6	658.0	77.7	77.7	77.7	77.7	77.6	77.6	3513	79.5
1983	5087.2	657.0	86.7	83.7	86.7	83.7	88.4	84.8	8221	93.8
1984	5341.3	696.0	89.6	86.1	89.6	86.1	87.3	85.8	8031	91.4
1985	5415.8	710.0	88.2	86.7	88.2	86.7	87.1	86.2	7912	90.3
1986	5840.2	710.0	95.1	88.6	95.1	88.6	93.9	88.0	8437	96.3
1987	5725.0	710.0	93.7	89.6	93.7	89.6	92.0	88.7	8379	95.7
1988	5713.2	710.0	92.7	90.1	92.7	90.1	91.6	89.2	8220	93.6
1989	5827.0	710.0	94.9	90.7	94.9	90.7	93.7	89.8	8363	95.5
1990	5749.9	710.0	93.8	91.1	93.8	91.1	92.4	90.1	8265	94.3
1991	5731.0	710.0	93.7	91.4	93.0	91.3	92.1	90.3	8216	93.8
1992	5790.4	710.0	94.5	91.7	93.3	91.5	92.8	90.6	8306	94.6
1993	5861.6	710.0	95.1	92.0	94.4	91.7	94.2	90.9	8327	95.1
1994	5732.6	710.0	93.2	92.1	92.3	91.8	92.2	91.0	8130	92.8
1995	5747.2	710.0	93.7	92.2	92.5	91.8	92.4	91.1	8236	94.0
1996	5915.4	710.0	95.3	92.4	95.0	92.1	94.8	91.4	8413	95.8
1997	6077.0	736.0	94.6	92.6	93.7	92.2	94.1	91.5	8258	94.3
1998	6628.5	840.0	94.3	92.7	93.2	92.2	90.1	91.4	8207	93.7
1999	7091.2	840.0	96.9	93.0	96.4	92.5	96.4	91.8	8505	97.1
2000	7028.9	840.0	95.9	93.1	95.3	92.7	95.3	92.0	8457	96.3
2001	6988.0	840.0	95.1	93.3	95.1	92.8	95.0	92.2	8387	95.7
2002	7108.5	840.0	97.0	93.5	96.8	93.1	96.6	92.4	8472	96.7
2003	7026.9	840.0	95.5	93.6	95.2	93.2	95.5	92.6	8378	95.6
2004	7080.7	840.0	95.8	93.7	95.8	93.3	96.0	92.7	8485	96.6
2005	6996.7	840.0	93.8	93.7	93.8	93.3	94.0	92.8	8248	94.2
2006	7294.4	860.0	97.4	93.9	96.4	93.5	96.8	93.0	8562	97.7
2007	7051.3	860.0	94.0	93.9	93.2	93.5	93.6	93.0	8258	94.3
2008	7313.8	860.0	96.9	94.0	96.3	93.6	97.1	93.2	8579	97.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		16			331	
B. Refuelling without a maintenance outage					10	
C. Inspection, maintenance or repair combined with refuelling	186			383		
D. Inspection, maintenance or repair without refuelling				15		
E. Testing of plant systems or component				24		
H. Nuclear regulatory requirement					1	
J. Grid limitation, failure or grid unavailability						12
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					2	4
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			2			
P. Fire					0	
Z. Others					1	
Subtotal	186	16	2	422	345	16
Total		204			783	

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems	5	0
13. Reactor Auxiliary Systems		0
14. Safety Systems		2
15. Reactor Cooling System	11	11
31. Turbine and auxiliaries		6
32. Feedwater and Main Steam System		7
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator System		287
42. Electrical Power Supply System		3
XX. Miscellaneous Systems		0
Total	16	325

# FR-54 BELLEVILLE-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 6305.0 GW(e).h  
 Energy Availability Factor: 55.2%  
 Load Factor: 54.8%  
 Operating Factor: 63.9%  
 Energy Unavailability Factor: 44.8%  
 Total Off-line Time: 3169 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	304.2	631.0	898.0	866.3	843.9	805.8	875.7	743.3	94.9	0.0	0.0	241.7	6305.0
EAF (%)	33.0	69.9	92.3	91.8	86.6	85.6	89.8	76.3	10.7	-0.1	0.0	26.5	55.2
UCF (%)	33.0	69.9	92.3	91.8	86.7	86.0	90.7	76.3	10.7	-0.1	0.0	26.5	55.3
LF (%)	31.2	69.2	92.1	91.8	86.6	85.4	89.8	76.3	10.1	0.0	0.0	24.8	54.8
OF (%)	36.0	76.6	99.9	100.0	100.0	95.7	100.0	100.0	16.9	0.0	0.0	41.4	63.9
EUF (%)	67.0	30.1	7.7	8.2	13.4	14.4	10.2	23.7	89.3	100.1	100.0	73.5	44.8
PUF (%)	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.5	83.5	100.1	30.0	14.1	19.1
UCLF (%)	67.0	30.1	7.7	8.2	13.0	13.9	9.3	23.3	5.8	0.0	70.0	59.4	25.6
XUF (%)	0.0	0.0	0.0	0.0	0.2	0.4	0.8	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 May 1980      Lifetime Generation: 166489.1 GW(e).h  
 Date of First Criticality: 09 Sep 1987      Cumulative Energy Availability Factor: 75.2%  
 Date of Grid Connection: 14 Oct 1987      Cumulative Load Factor: 69.1%  
 Date of Commercial Operation: 01 Jun 1988      Cumulative Unit Capability Factor: 76.5%  
    Cumulative Energy Unavailability Factor: 24.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	4334.0	1310.0	86.1	86.1	85.8	85.8	64.4	64.4	4421	86.1
1989	5152.6	1310.0	46.5	61.1	46.0	60.7	44.9	52.1	4244	48.4
1990	7914.3	1310.0	71.4	65.1	71.2	64.7	69.0	58.6	6408	73.2
1991	8660.2	1310.0	80.8	69.5	79.3	68.8	75.5	63.3	7092	81.0
1992	8494.3	1310.0	91.8	74.4	91.2	73.7	73.8	65.6	7600	86.5
1993	7921.5	1310.0	77.5	74.9	71.3	73.2	69.0	66.2	6873	78.5
1994	6575.8	1310.0	65.2	73.4	64.0	71.8	57.3	64.9	5848	66.8
1995	7740.9	1310.0	76.2	73.8	73.4	72.1	67.5	65.2	6796	77.6
1996	7365.1	1310.0	76.8	74.2	76.5	72.6	64.0	65.1	6002	68.3
1997	9785.3	1310.0	93.4	76.2	93.2	74.7	85.3	67.2	8294	94.7
1998	5740.9	1310.0	53.7	74.0	51.2	72.5	50.0	65.6	4865	55.5
1999	9580.5	1310.0	92.0	75.6	90.4	74.0	83.5	67.1	7957	90.8
2000	4238.6	1310.0	38.0	72.6	37.9	71.2	36.8	64.7	3459	39.4
2001	9564.5	1310.0	87.3	73.7	86.8	72.3	83.3	66.1	7774	88.7
2002	9567.3	1310.0	99.6	75.5	98.9	74.1	83.4	67.3	8447	96.4
2003	8401.7	1310.0	77.6	75.6	75.4	74.2	73.2	67.6	6871	78.4
2004	9291.0	1310.0	88.6	76.4	88.0	75.1	80.7	68.4	7645	87.0
2005	10236.4	1310.0	98.8	77.7	97.1	76.3	89.2	69.6	8646	98.7
2006	7926.7	1310.0	77.1	77.6	74.8	76.2	69.1	69.6	6870	78.4
2007	8512.1	1310.0	77.5	77.6	75.8	76.2	74.2	69.8	7213	82.3
2008	6305.0	1310.0	55.3	76.5	55.2	75.2	54.8	69.1	5615	63.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1586			458	
B. Refuelling without a maintenance					18	
C. Inspection, maintenance or repair combined with refuelling	1559			1036	9	
D. Inspection, maintenance or repair without refuelling				8		
E. Testing of plant systems or component				58	3	0
H. Nuclear regulatory requirement					106	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					79	1
L. Human factor related		24			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
Z. Others					0	
Subtotal	1559	1610	0	1102	676	4
Total		3169			1782	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		25
12. Reactor I&C Systems	48	71
13. Reactor Auxiliary System:	34	44
14. Safety Systems		35
15. Reactor Cooling System:		41
16. Steam generation system:	432	40
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries:	611	16
32. Feedwater and Main Steam System	275	78
35. All other I&C Systems:		0
41. Main Generator System:		43
42. Electrical Power Supply System:	21	18
XX. Miscellaneous Systems:	165	5
Total	1586	418

## FR-55 BELLEVILLE-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9734.9 GW(e).h  
 Energy Availability Factor: 92.3%  
 Load Factor: 84.8%  
 Operating Factor: 95.1%  
 Energy Unavailability Factor: 7.7%  
 Total Off-line Time: 433 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	319.9		840.0	872.8	789.3	763.7	865.7	772.8		928.8			9734.9
EAF (%)	34.2		92.9	97.7	96.4	92.4	99.2	98.4		99.2			92.3
UCF (%)	34.2		93.0	97.8	96.7	92.9	99.7	98.7		99.8			92.6
LF (%)	32.8		86.2	92.7	81.0	81.0	88.8	79.3		95.2			84.8
OF (%)	48.4		99.3	100.1	98.4	93.1	100.0	99.1		100.0			95.1
EUF (%)	65.8		7.1	2.3	3.6	7.6	0.8	1.6		0.8			7.7
PUF (%)	10.2		0.1	0.0	1.1	0.0	0.0	0.0		0.0			1.0
UCLF (%)	55.5		7.0	2.2	2.2	7.1	0.2	1.3		0.3			6.4
XUF (%)	0.0		0.0	0.1	0.3	0.4	0.5	0.3		0.5			0.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 167408.0 GW(e).h  
 Date of First Criticality: 25 May 1988      Cumulative Energy Availability Factor: 78.3%  
 Date of Grid Connection: 06 Jul 1988      Cumulative Load Factor: 72.1%  
 Date of Commercial Operation: 01 Jan 1989      Cumulative Unit Capability Factor: 79.9%  
    Cumulative Energy Unavailability Factor: 21.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	8505.7	1310.0	87.0	87.0	86.6	86.6	74.1	74.1	7419	84.7
1990	6324.0	1310.0	58.4	72.7	56.9	71.8	55.1	64.6	5350	61.1
1991	7876.3	1310.0	73.3	72.9	70.3	71.3	68.6	66.0	6578	75.1
1992	8262.1	1310.0	75.9	73.7	75.3	72.3	71.8	67.4	6904	78.6
1993	8871.3	1310.0	83.4	75.6	80.1	73.8	77.3	69.4	7435	84.9
1994	8241.3	1310.0	80.4	76.4	76.9	74.4	71.8	69.8	7122	81.3
1995	7960.5	1310.0	99.3	79.7	97.5	77.7	69.4	69.7	7438	84.9
1996	7229.8	1310.0	74.5	79.0	71.2	76.8	62.8	68.9	6666	75.9
1997	8508.1	1310.0	84.9	79.7	82.0	77.4	74.1	69.5	7339	83.8
1998	5068.0	1310.0	45.0	76.2	45.0	74.2	44.2	66.9	4239	48.4
1999	4899.3	1310.0	44.8	73.3	43.3	71.4	42.7	64.7	4040	46.1
2000	9882.5	1310.0	97.4	75.4	96.7	73.5	85.9	66.5	8271	94.2
2001	8458.0	1310.0	79.2	75.7	78.6	73.9	73.7	67.0	6935	79.2
2002	9378.7	1310.0	86.1	76.4	84.3	74.6	81.7	68.1	7687	87.8
2003	8624.7	1310.0	80.4	76.7	79.4	74.9	75.2	68.6	7135	81.4
2004	10202.6	1310.0	98.0	78.0	97.1	76.3	88.7	69.8	8621	98.1
2005	9242.3	1310.0	86.9	78.5	84.4	76.8	80.5	70.5	7767	88.7
2006	8743.6	1310.0	81.7	78.7	79.1	76.9	76.2	70.8	7309	83.4
2007	9516.0	1310.0	89.4	79.3	88.6	77.5	82.9	71.4	7895	90.1
2008	9734.9	1310.0	92.6	79.9	92.3	78.3	84.8	72.1	8327	95.1



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		462			329	
B. Refuelling without a maintenance					15	
C. Inspection, maintenance or repair combined with refuelling				966		
E. Testing of plant systems or component	37			53		
H. Nuclear regulatory requirement					134	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					67	
L. Human factor related					6	0
Z. Others					2	
Subtotal	37	462	0	1019	553	0
Total		499			1572	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		44
12. Reactor I&C Systems		54
13. Reactor Auxiliary System		12
14. Safety Systems		29
15. Reactor Cooling System		48
16. Steam generation system		33
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities	24	2
31. Turbine and auxiliaries	339	21
32. Feedwater and Main Steam System	5	15
33. Circulating Water System		2
41. Main Generator System		6
42. Electrical Power Supply System		11
XX. Miscellaneous Systems	94	1
Total	462	279

## FR-32 BLAYAIS-1

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6678.7 GW(e).h  
**Energy Availability Factor:** 83.6%  
**Load Factor:** 83.8%  
**Operating Factor:** 87.3%  
**Energy Unavailability Factor:** 16.4%  
**Total Off-line Time:** 1109 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	674.3	570.1	239.2	0.0	635.3	631.2	652.0	657.7	640.9	656.3	650.8	670.8	6678.7
<b>EAF (%)</b>	99.2	89.7	35.9	0.5	93.8	96.6	96.7	97.1	97.8	96.9	99.3	99.1	83.6
<b>UCF (%)</b>	99.9	99.9	45.3	0.5	94.6	98.1	99.6	99.8	99.3	97.0	99.3	99.1	86.1
<b>LF (%)</b>	99.6	93.2	35.3	0.0	93.8	96.3	96.3	97.1	97.8	96.8	99.3	99.1	83.8
<b>OF (%)</b>	100.0	103.6	45.4	2.1	100.0	98.6	100.0	100.0	100.0	98.3	100.0	100.0	87.3
<b>EUF (%)</b>	0.8	10.3	64.1	99.5	6.2	3.4	3.3	2.9	2.2	3.1	0.7	0.9	16.4
<b>PUF (%)</b>	0.0	0.0	54.7	71.9	4.3	0.0	0.0	0.2	0.0	0.0	0.2	0.2	11.0
<b>UCLF (%)</b>	0.1	0.1	0.0	27.6	1.2	1.9	0.4	0.1	0.7	3.0	0.5	0.7	3.0
<b>XUF (%)</b>	0.7	10.3	9.4	0.0	0.7	1.5	2.9	2.6	1.5	0.1	0.0	0.0	2.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

BASE LOAD

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jan 1977	<b>Lifetime Generation:</b>	156930.1 GW(e).h
<b>Date of First Criticality:</b>	20 May 1981	<b>Cumulative Energy Availability Factor:</b>	77.0%
<b>Date of Grid Connection:</b>	12 Jun 1981	<b>Cumulative Load Factor:</b>	72.2%
<b>Date of Commercial Operation:</b>	01 Dec 1981	<b>Cumulative Unit Capability Factor:</b>	79.4%
		<b>Cumulative Energy Unavailability Factor:</b>	23.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	449.0	915.0	65.6	65.6	65.6	65.6	65.6	65.6	522	70.2
1982	6129.8	910.0	81.5	80.2	81.5	80.2	76.9	76.0	7588	86.6
1983	3453.0	910.0	43.9	62.8	43.9	62.8	43.3	60.3	4285	48.9
1984	6509.0	910.0	84.6	69.9	84.6	69.9	81.4	67.2	7536	85.8
1985	6225.2	910.0	83.0	73.1	82.8	73.0	78.1	69.8	7348	83.9
1986	6460.6	910.0	87.8	76.0	87.0	75.8	81.0	72.1	7754	88.5
1987	5586.6	910.0	78.2	76.3	76.2	75.8	70.1	71.7	6793	77.5
1988	5730.0	910.0	82.1	77.1	81.3	76.6	71.7	71.7	7069	80.5
1989	6222.4	910.0	84.2	78.0	83.3	77.4	78.1	72.5	7419	84.7
1990	5822.6	910.0	77.2	77.9	76.9	77.4	73.0	72.6	6834	78.0
1991	6379.0	910.0	83.8	78.5	83.3	78.0	80.0	73.3	7400	84.5
1992	4349.2	910.0	57.5	76.6	56.6	76.0	54.4	71.6	5079	57.8
1993	5979.2	910.0	83.7	77.2	78.3	76.2	75.0	71.9	7253	82.8
1994	3474.9	910.0	86.6	77.9	85.8	77.0	43.6	69.7	5119	58.4
1995	6075.8	910.0	87.1	78.6	84.3	77.5	76.2	70.2	7206	82.3
1996	6639.1	910.0	88.5	79.2	85.6	78.0	83.1	71.0	7798	88.8
1997	6196.6	910.0	90.1	79.9	84.6	78.4	77.7	71.4	7621	87.0
1998	5917.6	910.0	81.1	80.0	78.2	78.4	74.2	71.6	7078	80.8
1999	6046.8	910.0	80.9	80.0	77.9	78.4	75.9	71.8	7082	80.8
2000	2854.1	910.0	53.4	78.6	36.6	76.2	35.7	69.9	3602	41.0
2001	4881.5	910.0	66.2	78.0	64.0	75.6	61.2	69.5	5768	65.8
2002	6861.1	910.0	95.0	78.8	93.0	76.4	86.1	70.3	8251	94.2
2003	4541.7	910.0	61.8	78.0	58.1	75.6	57.0	69.7	5321	60.7
2004	6144.3	910.0	81.5	78.2	79.2	75.7	76.9	70.0	7217	82.2
2005	6883.6	910.0	87.7	78.6	86.8	76.2	86.3	70.7	7841	89.5
2006	6508.0	910.0	84.0	78.8	81.6	76.4	81.6	71.1	7440	84.9
2007	6891.0	910.0	88.3	79.2	86.4	76.8	86.4	71.7	7791	88.9
2008	6678.7	910.0	86.1	79.4	83.6	77.0	83.8	72.2	7651	87.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		223			397	0
B. Refuelling without a maintenance				47		
C. Inspection, maintenance or repair combined with refuelling	911			945	6	
D. Inspection, maintenance or repair without refuelling				42		
E. Testing of plant systems or component:	0			1	1	
H. Nuclear regulatory requirement					75	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					28	54
L. Human factor related					14	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
Z. Others					6	
Subtotal	911	223	0	1035	527	55
Total		1134			1617	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		30
12. Reactor I&C Systems		46
13. Reactor Auxiliary System:		5
14. Safety Systems		4
15. Reactor Cooling System:		72
16. Steam generation system:	199	3
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	21	31
32. Feedwater and Main Steam System		36
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator System:	3	87
42. Electrical Power Supply System:		14
Total	223	329

# FR-33 BLAYAIS-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 7191.2 GW(e).h  
 Energy Availability Factor: 89.7%  
 Load Factor: 90.0%  
 Operating Factor: 90.8%  
 Energy Unavailability Factor: 10.3%  
 Total Off-line Time: 808 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	686.7	642.9	671.2	660.6	674.0	643.2	214.4	340.0	634.4	677.6	656.0	690.2	7191.2
EAF (%)	99.0	99.6	98.3	99.9	100.0	97.9	33.0	50.7	99.8	100.0	99.8	99.9	89.7
UCF (%)	99.6	99.6	99.9	99.9	100.0	100.0	35.8	50.7	99.8	100.0	99.8	99.9	90.3
LF (%)	101.4	101.5	99.1	100.8	99.6	98.2	31.7	50.2	96.8	100.0	100.1	101.9	90.0
OF (%)	100.0	100.0	99.9	100.0	100.0	100.0	35.9	55.6	100.0	100.0	100.0	100.0	90.8
EUf (%)	1.0	0.4	1.7	0.1	0.0	2.1	67.0	49.3	0.2	0.0	0.2	0.1	10.3
PUF (%)	0.2	0.4	0.0	0.0	0.0	0.0	64.2	19.3	0.2	0.0	0.1	0.0	7.1
UCLF (%)	0.3	0.0	0.1	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.1	0.1	2.6
XUF (%)	0.6	0.0	1.6	0.0	0.0	2.1	2.8	0.0	0.0	0.0	0.0	0.0	0.6

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Jan 1977      Lifetime Generation: 160073.5 GW(e).h  
 Date of First Criticality: 28 Jun 1982      Cumulative Energy Availability Factor: 80.5%  
 Date of Grid Connection: 17 Jul 1982      Cumulative Load Factor: 76.4%  
 Date of Commercial Operation: 01 Feb 1983      Cumulative Unit Capability Factor: 82.5%  
    Cumulative Energy Unavailability Factor: 19.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	4490.0	910.0	62.3	62.3	62.3	62.3	61.6	61.6	5120	63.9
1984	6645.0	910.0	85.5	74.5	85.5	74.5	83.1	72.8	7716	87.8
1985	6819.7	910.0	90.0	79.8	89.9	79.8	85.5	77.2	7937	90.6
1986	6048.4	910.0	83.2	80.7	82.9	80.5	75.9	76.9	7142	81.5
1987	5987.1	910.0	84.8	81.5	84.2	81.3	75.1	76.5	7218	82.4
1988	4162.0	910.0	91.2	83.1	90.8	82.9	52.1	72.4	5718	65.1
1989	5561.0	910.0	77.0	82.3	73.4	81.5	69.8	72.0	6720	76.7
1990	5656.4	910.0	87.4	82.9	85.7	82.1	71.0	71.9	7381	84.3
1991	5326.5	910.0	78.3	82.4	75.1	81.3	66.8	71.3	6789	77.5
1992	5953.3	910.0	86.9	82.8	83.7	81.5	74.5	71.6	7505	85.4
1993	5253.2	910.0	71.0	81.8	67.0	80.2	65.9	71.1	6203	70.8
1994	6692.6	910.0	88.7	82.3	88.1	80.9	84.0	72.2	7658	87.4
1995	6725.5	910.0	87.9	82.8	85.6	81.2	84.4	73.1	7775	88.8
1996	6709.8	910.0	87.4	83.1	85.0	81.5	83.9	73.9	7587	86.4
1997	6769.9	910.0	88.7	83.5	84.8	81.7	84.9	74.6	7681	87.7
1998	6974.3	910.0	90.0	83.9	87.2	82.1	87.5	75.4	7883	90.0
1999	5836.2	910.0	75.1	83.4	73.1	81.5	73.2	75.3	6544	74.7
2000	4941.1	910.0	75.2	82.9	63.0	80.5	61.8	74.6	5592	63.7
2001	6548.0	910.0	83.6	83.0	81.9	80.6	82.1	75.0	7358	84.0
2002	5972.0	910.0	84.3	83.0	82.7	80.7	74.9	75.0	7357	84.0
2003	5181.2	910.0	66.0	82.2	63.7	79.9	65.0	74.5	5784	66.0
2004	6734.6	910.0	82.6	82.2	81.5	79.9	84.3	74.9	7346	83.6
2005	6918.8	910.0	85.0	82.3	84.6	80.1	86.8	75.4	7513	85.8
2006	6786.7	910.0	86.0	82.5	85.4	80.4	85.1	75.8	7599	86.7
2007	6035.6	910.0	75.8	82.2	74.3	80.1	75.7	75.8	6686	76.3
2008	7191.2	910.0	90.3	82.5	89.7	80.5	90.0	76.4	7977	90.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		85			197	
B. Refuelling without a maintenance	584			40	2	
C. Inspection, maintenance or repair combined with refuelling				1061	2	
D. Inspection, maintenance or repair without refuelling				25		
E. Testing of plant systems or component				75	0	
H. Nuclear regulatory requirement					15	
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					10	52
L. Human factor related		138				
Z. Others					11	
Subtotal	584	223	0	1201	237	56
Total		807			1494	

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year	
11. Reactor and Accessories	37		24
12. Reactor I&C Systems			6
13. Reactor Auxiliary Systems			7
14. Safety Systems			13
15. Reactor Cooling Systems			28
16. Steam generation system	48		3
31. Turbine and auxiliaries			19
32. Feedwater and Main Steam System			54
33. Circulating Water System			5
41. Main Generator Systems			5
42. Electrical Power Supply System			5
Total	85		169

# FR-34 BLAYAIS-3

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 7138.3 GW(e).h  
 Energy Availability Factor: 86.8%  
 Load Factor: 89.5%  
 Operating Factor: 87.6%  
 Energy Unavailability Factor: 13.2%  
 Total Off-line Time: 1084 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h		655.3							113.5				7138.3
EAF (%)		99.7							18.6				86.8
UCF (%)		99.7							18.6				87.0
LF (%)		107.2							17.3				89.5
OF (%)		103.6							22.4				87.6
EUf (%)		0.3							81.4				13.2
PUF (%)		0.0							81.2				13.0
UCLF (%)		0.3							0.2				0.0
XUF (%)		0.0							0.0				0.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

BASE LOAD

## 5. Historical Summary

Date of Construction Start: 01 Apr 1978      Lifetime Generation: 154977.1 GW(e).h  
 Date of First Criticality: 29 Jul 1983      Cumulative Energy Availability Factor: 80.7%  
 Date of Grid Connection: 17 Aug 1983      Cumulative Load Factor: 76.9%  
 Date of Commercial Operation: 14 Nov 1983      Cumulative Unit Capability Factor: 82.6%  
    Cumulative Energy Unavailability Factor: 19.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	1164.0	910.0	87.4	87.4	87.4	87.4	87.4	87.4	1273	87.0
1984	5944.0	910.0	80.3	81.4	80.3	81.4	74.4	76.2	7055	80.3
1985	6568.9	910.0	87.0	83.9	86.6	83.8	82.4	79.1	7729	88.2
1986	6504.9	910.0	88.3	85.3	88.1	85.1	81.6	79.9	7759	88.6
1987	4304.7	910.0	93.9	87.4	93.5	87.1	54.0	73.7	5473	62.5
1988	5287.0	910.0	82.8	86.5	81.6	86.1	66.1	72.2	6708	76.4
1989	6086.4	910.0	82.7	85.9	78.5	84.8	76.4	72.9	7292	83.2
1990	4871.2	910.0	64.3	82.9	62.8	81.8	61.1	71.2	5673	64.8
1991	6372.3	910.0	84.6	83.1	84.0	82.0	79.9	72.3	7448	85.0
1992	5967.9	910.0	83.0	83.1	81.8	82.0	74.7	72.6	7220	82.2
1993	6285.3	910.0	87.7	83.5	79.8	81.8	78.8	73.2	7728	88.2
1994	4212.8	910.0	57.8	81.2	57.7	79.6	52.8	71.4	4979	56.8
1995	6739.6	910.0	85.9	81.6	85.4	80.1	84.5	72.4	7525	85.9
1996	6924.1	910.0	87.1	82.0	86.8	80.6	86.6	73.5	7744	88.2
1997	6614.1	910.0	86.4	82.3	86.4	81.0	83.0	74.2	7659	87.4
1998	6970.2	910.0	90.1	82.8	87.8	81.5	87.4	75.1	7954	90.8
1999	5123.0	910.0	66.8	81.9	64.2	80.4	64.3	74.4	5861	66.9
2000	6183.6	910.0	80.3	81.8	78.2	80.3	77.4	74.6	7143	81.3
2001	6707.1	910.0	85.4	82.0	84.2	80.5	84.1	75.1	7540	86.1
2002	6882.0	910.0	87.5	82.2	86.4	80.8	86.3	75.7	7682	87.7
2003	5844.9	910.0	86.5	82.5	73.6	80.4	73.3	75.6	6725	76.8
2004	5822.8	910.0	75.2	82.1	72.5	80.1	72.8	75.4	6699	76.3
2005	5868.1	910.0	80.3	82.0	76.4	79.9	73.6	75.4	6875	78.5
2006	6515.7	910.0	82.8	82.1	81.5	80.0	81.7	75.6	7340	83.8
2007	7441.7	910.0	90.9	82.4	90.9	80.4	93.4	76.4	8035	91.7
2008	7138.3	910.0	87.0	82.6	86.8	80.7	89.5	76.9	7676	87.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					275	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1108			965	6	
D. Inspection, maintenance or repair without refuelling				27		
E. Testing of plant systems or component				6	0	
H. Nuclear regulatory requirement					30	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					53	14
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						22
Subtotal	1108	0	0	998	365	36
Total	1108			1399		

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		13
13. Reactor Auxiliary System:		37
14. Safety Systems		6
15. Reactor Cooling System:		12
16. Steam generation system:		63
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		6
33. Circulating Water System		0
41. Main Generator System:		42
42. Electrical Power Supply System:		14
XX. Miscellaneous Systems		0
Total	0	214



**FR-35 BLAYAIS-4**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR

Net Reference Unit Power  
at the beginning of 2008: 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 2008**

Net Energy Production: 6755.7 GW(e).h

Energy Availability Factor: 87.0%

Load Factor: 84.5%

Operating Factor: 88.3%

Energy Unavailability Factor: 13.0%

Total Off-line Time: 1025 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	675.0	629.2	669.8	651.6	31.2	350.1	624.3	605.0	604.8	646.4	624.3	644.1	6755.7
EAF (%)	99.8	99.9	99.8	99.3	5.5	54.5	97.7	98.0	96.9	98.3	98.7	96.1	87.0
UCF (%)	99.8	100.0	99.8	99.8	7.8	54.7	98.3	98.3	97.2	98.3	99.9	96.1	87.4
LF (%)	99.7	99.3	98.9	99.4	4.6	53.4	92.2	89.4	92.3	95.3	95.3	95.1	84.5
OF (%)	100.0	100.0	99.9	100.0	5.8	59.4	100.0	100.0	99.2	100.0	100.0	96.6	88.3
EUF (%)	0.2	0.1	0.2	0.7	94.5	45.5	2.3	2.0	3.1	1.7	1.3	3.9	13.0
PUF (%)	0.2	0.0	0.1	0.0	85.6	4.5	0.3	0.0	0.1	0.6	0.0	0.1	7.7
UCLF (%)	0.0	0.0	0.1	0.2	6.6	40.8	1.4	1.7	2.7	1.0	0.1	3.8	4.8
XUF (%)	0.0	0.1	0.0	0.5	2.3	0.2	0.6	0.3	0.3	0.1	1.2	0.0	0.5

UCLF replaces previously used UUF.

**4. 2008 Summary of Operation**

LOAD FOLLOWING

**5. Historical Summary**

Date of Construction Start: 01 Apr 1978      Lifetime Generation: 153405.6 GW(e).h

Date of First Criticality: 01 May 1983      Cumulative Energy Availability Factor: 80.2%

Date of Grid Connection: 16 May 1983      Cumulative Load Factor: 75.5%

Date of Commercial Operation: 01 Oct 1983      Cumulative Unit Capability Factor: 82.3%

   Cumulative Energy Unavailability Factor: 19.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	1898.0	910.0	93.5	93.5	93.5	93.5	94.5	94.5	2092	94.7
1984	6012.0	910.0	76.0	79.5	76.0	79.5	75.2	79.1	6780	77.2
1985	5972.6	910.0	78.8	79.2	78.7	79.2	74.9	77.2	7024	80.2
1986	6278.1	910.0	82.5	80.2	81.9	80.0	78.8	77.7	7412	84.6
1987	6104.6	910.0	85.6	81.5	83.9	80.9	76.6	77.4	7437	84.9
1988	4337.0	910.0	71.5	79.6	70.2	78.9	54.3	73.0	5662	64.5
1989	5816.3	910.0	89.4	81.1	87.5	80.2	73.0	73.0	7250	82.8
1990	5912.3	910.0	83.4	81.5	78.2	80.0	74.2	73.2	7347	83.9
1991	5467.7	910.0	73.5	80.5	73.1	79.1	68.6	72.6	6496	74.2
1992	6120.6	910.0	84.1	80.9	83.5	79.6	76.6	73.0	7430	84.6
1993	5096.4	910.0	85.3	81.3	72.9	78.9	63.9	72.2	6854	78.2
1994	5897.1	910.0	82.6	81.4	81.8	79.2	74.0	72.3	7308	83.4
1995	5342.4	910.0	75.2	80.9	71.5	78.6	67.0	71.9	6198	70.8
1996	6719.6	910.0	88.2	81.5	86.9	79.2	84.1	72.8	7761	88.4
1997	6497.2	910.0	89.1	82.0	86.6	79.7	81.5	73.4	7705	88.0
1998	6692.6	910.0	90.3	82.6	87.9	80.3	84.0	74.1	7930	90.5
1999	6161.2	910.0	83.3	82.6	80.2	80.3	77.3	74.3	7369	84.1
2000	5467.5	910.0	75.1	82.2	72.5	79.8	68.4	74.0	6559	74.7
2001	6370.0	910.0	82.4	82.2	82.1	79.9	79.9	74.3	7297	83.3
2002	6462.2	910.0	86.2	82.4	85.1	80.2	81.1	74.6	7623	87.0
2003	5311.1	910.0	72.9	81.9	68.4	79.6	66.6	74.2	6292	71.8
2004	6560.3	910.0	88.3	82.2	84.6	79.9	82.1	74.6	7749	88.2
2005	5454.7	910.0	71.5	81.7	69.6	79.4	68.4	74.3	6357	72.6
2006	6758.4	910.0	88.5	82.0	86.5	79.7	84.8	74.8	7827	89.3
2007	6607.8	910.0	84.7	82.1	84.2	79.9	82.9	75.1	7484	85.4
2008	6755.7	910.0	87.4	82.3	87.0	80.2	84.5	75.5	7760	88.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		155			289	
B. Refuelling without a maintenance	637				1	
C. Inspection, maintenance or repair combined with refuelling				990	34	
D. Inspection, maintenance or repair without refuelling				8	0	
E. Testing of plant systems or components				1	0	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						2
H. Nuclear regulatory requirement		218			1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					12	22
L. Human factor related					3	
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.			16			
Z. Others					13	
Subtotal	637	373	16	999	353	30
Total		1026			1382	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems	6	56
13. Reactor Auxiliary Systems	16	13
15. Reactor Cooling Systems		5
16. Steam generation system	108	19
31. Turbine and auxiliaries		48
32. Feedwater and Main Steam System		7
33. Circulating Water System		10
41. Main Generator Systems	25	48
42. Electrical Power Supply Systems		19
XX. Miscellaneous Systems		0
Total	155	227

## FR-13 BUGEY-2

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6130.8 GW(e).h  
**Energy Availability Factor:** 77.7%  
**Load Factor:** 76.7%  
**Operating Factor:** 85.6%  
**Energy Unavailability Factor:** 22.3%  
**Total Off-line Time:** 1267 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	646.5	616.7	632.3	571.6	640.8	602.6	534.4	540.7	528.3	50.9	115.7	650.2	6130.8
<b>EAF (%)</b>	96.0	98.5	95.3	88.5	97.9	94.9	79.3	79.9	80.6	7.8	18.6	96.0	77.7
<b>UCF (%)</b>	99.8	100.0	97.1	90.3	98.9	98.2	80.0	79.9	80.6	7.8	18.6	96.1	78.9
<b>LF (%)</b>	95.5	97.4	93.4	87.2	94.7	92.0	78.9	79.9	80.6	7.5	17.7	96.0	76.7
<b>OF (%)</b>	100.0	100.0	97.6	91.1	100.0	100.0	98.5	100.0	100.0	9.9	30.0	100.0	85.6
<b>EUF (%)</b>	4.0	1.5	4.7	11.5	2.1	5.1	20.7	20.1	19.4	92.2	81.4	4.0	22.3
<b>PUF (%)</b>	0.0	0.0	0.3	0.0	0.0	0.0	2.0	0.0	0.0	90.4	77.5	0.1	14.2
<b>UCLF (%)</b>	0.1	0.0	2.6	9.7	1.1	1.8	18.1	20.1	19.4	1.9	3.9	3.9	6.9
<b>XUF (%)</b>	3.8	1.5	1.8	1.8	1.0	3.4	0.7	0.0	0.0	0.0	0.0	0.0	1.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Nov 1972	<b>Lifetime Generation:</b>	162491.3 GW(e).h
<b>Date of First Criticality:</b>	20 Apr 1978	<b>Cumulative Energy Availability Factor:</b>	72.3%
<b>Date of Grid Connection:</b>	10 May 1978	<b>Cumulative Load Factor:</b>	67.4%
<b>Date of Commercial Operation:</b>	01 Mar 1979	<b>Cumulative Unit Capability Factor:</b>	74.2%
		<b>Cumulative Energy Unavailability Factor:</b>	27.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	3535.0	925.0	53.2	53.2	53.2	53.2	52.0	52.0	4442	60.5
1980	4460.0	920.0	55.7	54.5	55.7	54.5	55.2	53.7	5271	60.0
1981	5209.6	920.0	65.2	58.3	65.2	58.3	64.6	57.6	6017	68.7
1982	3341.7	920.0	41.6	53.9	41.6	53.9	41.5	53.4	3863	44.1
1983	6725.0	920.0	85.3	60.4	85.3	60.4	83.4	59.6	7689	87.8
1984	5748.0	920.0	87.9	65.1	87.9	65.1	71.1	61.6	6580	74.9
1985	5948.8	920.0	79.7	67.3	76.0	66.7	73.8	63.4	7118	81.3
1986	5945.6	920.0	86.4	69.7	84.5	69.0	73.8	64.7	7515	85.8
1987	3581.1	920.0	53.4	67.9	51.6	67.0	44.4	62.4	4729	54.0
1988	4495.0	920.0	67.0	67.8	63.1	66.6	55.6	61.7	5718	65.1
1989	4700.8	920.0	64.7	67.5	61.1	66.1	58.3	61.4	5721	65.3
1990	4878.7	920.0	69.7	67.7	69.3	66.4	60.5	61.3	6213	70.9
1991	4927.2	920.0	66.7	67.6	64.4	66.2	61.1	61.3	6001	68.5
1992	3918.3	910.0	53.9	66.6	50.2	65.1	49.0	60.4	4781	54.4
1993	4509.9	910.0	99.2	68.8	94.2	67.0	56.6	60.2	5718	65.3
1994	5782.2	910.0	77.7	69.3	76.5	67.6	72.5	60.9	6811	77.8
1995	6045.7	910.0	79.6	70.0	78.1	68.2	75.8	61.8	7051	80.5
1996	5533.9	910.0	78.7	70.4	75.4	68.6	69.2	62.2	6863	78.1
1997	5477.7	910.0	84.4	71.2	81.0	69.3	68.7	62.6	6815	77.8
1998	5379.4	910.0	77.6	71.5	72.9	69.5	67.5	62.8	6605	75.4
1999	5960.3	910.0	78.9	71.9	77.5	69.9	74.8	63.4	7050	80.5
2000	5183.5	910.0	68.5	71.7	66.3	69.7	64.8	63.5	6025	68.6
2001	5685.9	910.0	72.3	71.7	72.2	69.8	71.3	63.8	6493	74.1
2002	5542.3	910.0	70.2	71.7	69.9	69.8	69.5	64.0	6212	70.9
2003	5521.7	910.0	74.8	71.8	71.0	69.9	69.3	64.2	6579	75.1
2004	7593.4	910.0	97.1	72.8	96.0	70.9	95.0	65.4	8571	97.6
2005	6373.9	910.0	86.7	73.3	81.7	71.3	80.0	66.0	7607	86.8
2006	6125.7	910.0	80.9	73.6	79.2	71.5	76.9	66.4	7158	81.7
2007	6925.1	910.0	88.7	74.1	87.6	72.1	86.9	67.1	7880	89.9
2008	6130.8	910.0	78.9	74.2	77.7	72.3	76.7	67.4	7517	85.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		79			536	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1175			1148	42	
D. Inspection, maintenance or repair without refuelling				121		
E. Testing of plant systems or component	11			11	0	
H. Nuclear regulatory requirement				42	0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				2	53	14
L. Human factor related					13	0
Z. Others					10	
Subtotal	1186	79	0	1324	655	14
Total		1265			1993	

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		173
12. Reactor I&C Systems		21
13. Reactor Auxiliary System:		10
14. Safety Systems		67
15. Reactor Cooling System:		34
16. Steam generation system:		17
21. Fuel Handling and Storage Facilities		62
31. Turbine and auxiliaries	29	24
32. Feedwater and Main Steam System	50	24
33. Circulating Water System		1
35. All other I&C Systems:		0
41. Main Generator System:		70
42. Electrical Power Supply System:		5
XX. Miscellaneous Systems		0
Total	79	508

## FR-14 BUGEY-3

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 5807.1 GW(e).h  
**Energy Availability Factor:** 72.9%  
**Load Factor:** 72.6%  
**Operating Factor:** 83.7%  
**Energy Unavailability Factor:** 27.1%  
**Total Off-line Time:** 1433 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	170.4	531.4	642.8	646.2	610.6	486.2	538.8	534.3	552.9	538.5	555.0	5807.1
<b>EAF (%)</b>	0.0	27.9	79.2	98.1	97.2	93.2	72.1	79.6	81.6	81.6	82.2	82.0	72.9
<b>UCF (%)</b>	0.0	27.9	79.9	100.0	100.0	94.2	72.1	79.6	81.6	81.6	82.2	82.0	73.5
<b>LF (%)</b>	0.0	26.9	78.5	98.1	95.4	93.2	71.8	79.6	81.6	81.6	82.2	82.0	72.6
<b>OF (%)</b>	0.0	32.8	82.3	100.0	98.8	100.0	89.2	100.0	100.0	100.0	100.0	100.0	83.7
<b>EUF (%)</b>	100.0	72.1	20.8	1.9	2.8	6.8	27.9	20.4	18.4	18.4	17.8	18.0	27.1
<b>PUF (%)</b>	96.8	59.6	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.3	0.0	0.0	13.2
<b>UCLF (%)</b>	3.2	12.5	20.1	0.0	0.0	5.8	25.1	20.4	18.5	18.1	17.8	18.0	13.3
<b>XUF (%)</b>	0.0	0.0	0.7	1.9	2.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Sep 1973	<b>Lifetime Generation:</b>	162410.9 GW(e).h
<b>Date of First Criticality:</b>	31 Aug 1978	<b>Cumulative Energy Availability Factor:</b>	73.3%
<b>Date of Grid Connection:</b>	21 Sep 1978	<b>Cumulative Load Factor:</b>	67.7%
<b>Date of Commercial Operation:</b>	01 Mar 1979	<b>Cumulative Unit Capability Factor:</b>	75.3%
		<b>Cumulative Energy Unavailability Factor:</b>	26.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	2744.0	925.0	39.9	39.9	39.9	39.9	40.4	40.4	3308	45.0
1980	5960.0	920.0	74.7	58.8	74.7	58.8	73.8	58.5	6951	79.1
1981	4849.6	920.0	61.0	59.6	61.0	59.6	60.2	59.1	5646	64.5
1982	6002.2	920.0	78.9	64.6	78.9	64.6	74.5	63.1	7661	87.5
1983	5525.0	920.0	74.0	66.5	74.0	66.5	68.6	64.2	6556	74.8
1984	5793.0	920.0	78.0	68.5	78.0	68.5	71.7	65.5	6905	78.6
1985	4571.1	920.0	58.7	67.1	57.2	66.8	56.7	64.2	5235	59.8
1986	6558.1	920.0	87.7	69.7	87.1	69.4	81.4	66.4	7634	87.1
1987	5482.5	920.0	78.4	70.7	76.4	70.2	68.0	66.6	6637	75.8
1988	3812.0	920.0	64.7	70.1	62.4	69.4	47.2	64.6	4935	56.2
1989	4914.3	920.0	88.7	71.8	87.4	71.1	61.0	64.3	6467	73.8
1990	4538.6	920.0	68.0	71.5	62.9	70.4	56.3	63.6	5474	62.5
1991	3442.8	920.0	55.7	70.2	51.7	68.9	42.7	62.0	4168	47.6
1992	2490.0	910.0	32.5	67.5	32.2	66.3	31.2	59.8	2879	32.8
1993	5954.4	910.0	80.2	68.4	76.1	67.0	74.7	60.8	7117	81.2
1994	4717.7	910.0	70.0	68.5	65.2	66.9	59.2	60.7	5872	67.0
1995	5535.7	910.0	95.9	70.1	95.2	68.5	69.4	61.2	6564	74.9
1996	5652.9	910.0	78.7	70.6	76.4	69.0	70.7	61.7	7012	79.8
1997	5596.6	910.0	75.0	70.8	74.9	69.3	70.2	62.2	6561	74.9
1998	6680.4	910.0	89.1	71.7	89.0	70.3	83.8	63.2	7875	89.9
1999	5786.6	910.0	77.6	72.0	77.3	70.6	72.6	63.7	7001	79.9
2000	5745.1	910.0	75.7	72.2	74.7	70.8	71.9	64.1	6765	77.0
2001	6230.6	910.0	81.8	72.6	81.2	71.2	78.2	64.7	7129	81.4
2002	4634.7	880.0	65.3	72.3	62.7	70.9	60.1	64.5	5654	64.5
2003	6646.1	910.0	97.2	73.3	85.2	71.5	83.4	65.2	7924	90.5
2004	6447.3	910.0	88.2	73.9	87.9	72.1	80.7	65.8	7461	84.9
2005	5805.4	910.0	82.3	74.2	76.8	72.3	72.8	66.1	7017	80.1
2006	6563.5	910.0	89.1	74.7	83.9	72.7	82.3	66.7	7624	87.0
2007	7277.8	910.0	93.4	75.4	91.4	73.3	91.3	67.5	8258	94.3
2008	5807.1	910.0	73.5	75.3	72.9	73.3	72.6	67.7	7352	83.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		216			507	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	1106			969	41	
D. Inspection, maintenance or repair without refuelling				74		
E. Testing of plant systems or component:	16			46	0	
H. Nuclear regulatory requirement					0	3
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			9		63	57
L. Human factor related		88			4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						19
Z. Others					2	
Subtotal	1122	304	9	1089	621	79
Total		1435			1789	

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		208
12. Reactor I&C Systems		7
13. Reactor Auxiliary System:		15
14. Safety Systems		21
15. Reactor Cooling System:		42
16. Steam generation system:	19	21
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries	136	40
32. Feedwater and Main Steam System	61	25
33. Circulating Water System		1
41. Main Generator System:		101
42. Electrical Power Supply System:		15
XX. Miscellaneous Systems		1
Total	216	497



## FR-15 BUGEY-4

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6790.4 GW(e).h  
**Energy Availability Factor:** 87.7%  
**Load Factor:** 87.8%  
**Operating Factor:** 89.8%  
**Energy Unavailability Factor:** 12.3%  
**Total Off-line Time:** 894 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	617.5	616.0	637.6	629.1	629.5	592.5	497.5	15.6	615.0	645.9	633.9	660.2	6790.4
<b>EAF (%)</b>	94.1	99.9	96.9	99.1	96.1	93.2	76.3	3.6	97.1	98.5	99.6	100.0	87.7
<b>UCF (%)</b>	94.1	100.0	96.9	99.4	96.6	95.5	79.6	3.6	98.2	100.0	99.9	100.0	88.5
<b>LF (%)</b>	94.3	100.6	97.4	99.3	96.1	93.5	76.0	2.4	97.1	98.5	100.0	100.8	87.8
<b>OF (%)</b>	95.6	100.0	97.2	100.0	100.0	96.1	81.0	9.8	100.0	100.0	100.0	100.0	89.8
<b>EUF (%)</b>	5.9	0.1	3.1	0.9	3.9	6.8	23.7	96.4	2.9	1.5	0.4	0.0	12.3
<b>PUF (%)</b>	0.0	0.0	3.0	0.0	0.0	0.2	19.1	93.7	1.8	0.0	0.0	0.0	10.0
<b>UCLF (%)</b>	5.9	0.0	0.0	0.6	3.4	4.4	1.3	2.7	0.0	0.0	0.0	0.0	1.5
<b>XUF (%)</b>	0.0	0.0	0.1	0.3	0.5	2.3	3.3	0.0	1.2	1.5	0.3	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jun 1974	<b>Lifetime Generation:</b>	155713.6 GW(e).h
<b>Date of First Criticality:</b>	17 Feb 1979	<b>Cumulative Energy Availability Factor:</b>	72.9%
<b>Date of Grid Connection:</b>	08 Mar 1979	<b>Cumulative Load Factor:</b>	67.4%
<b>Date of Commercial Operation:</b>	01 Jul 1979	<b>Cumulative Unit Capability Factor:</b>	75.1%
		<b>Cumulative Energy Unavailability Factor:</b>	27.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	2323.0	900.0	64.6	64.6	64.6	64.6	58.4	58.4	2854	64.6
1980	5063.0	900.0	65.8	65.4	65.8	65.4	64.0	62.2	5983	68.1
1981	5671.9	900.0	75.6	69.5	75.6	69.5	71.9	66.1	6834	78.0
1982	5474.9	900.0	69.8	69.6	69.8	69.6	69.4	67.0	6276	71.6
1983	6329.0	900.0	83.3	72.6	83.2	72.6	80.3	70.0	7389	84.3
1984	5882.0	900.0	75.8	73.2	75.8	73.2	74.4	70.8	6896	78.5
1985	6224.4	900.0	87.2	75.3	86.7	75.3	78.9	72.0	7696	87.9
1986	5312.7	900.0	78.7	75.8	76.1	75.4	67.4	71.4	6622	75.6
1987	4670.9	900.0	79.8	76.3	78.2	75.7	59.2	70.0	6180	70.5
1988	3323.0	900.0	67.3	75.3	51.5	73.1	42.0	67.0	4524	51.5
1989	5541.3	900.0	76.7	75.5	76.2	73.4	70.3	67.3	6846	78.2
1990	3186.6	880.0	56.7	73.9	53.5	71.7	41.3	65.1	4312	49.2
1991	4984.9	880.0	71.8	73.7	69.3	71.6	64.7	65.1	6317	72.1
1992	1649.1	880.0	22.2	69.9	22.2	68.0	21.3	61.9	2012	22.9
1993	5748.6	880.0	82.2	70.8	74.2	68.4	74.6	62.8	7506	85.7
1994	5209.3	880.0	83.5	71.6	82.2	69.3	67.6	63.1	6619	75.6
1995	3989.9	880.0	64.3	71.1	59.1	68.7	51.8	62.4	4843	55.3
1996	4188.1	880.0	62.6	70.7	62.4	68.3	54.2	61.9	5333	60.7
1997	5652.5	880.0	83.6	71.3	80.7	69.0	73.3	62.5	7420	84.7
1998	6304.0	880.0	88.3	72.2	86.3	69.8	81.8	63.5	7791	88.9
1999	5591.3	880.0	81.5	72.7	77.5	70.2	72.5	63.9	7231	82.5
2000	5988.0	880.0	85.1	73.2	82.6	70.8	77.5	64.6	7544	85.9
2001	4746.0	880.0	65.8	72.9	63.4	70.5	61.6	64.4	5921	67.6
2002	5590.8	880.0	83.5	73.3	83.4	71.0	72.5	64.8	7130	81.4
2003	6645.3	880.0	95.6	74.2	94.2	71.9	86.2	65.6	8192	93.5
2004	6098.3	880.0	83.0	74.6	81.3	72.3	78.9	66.2	7367	83.9
2005	6073.2	880.0	84.0	74.9	80.3	72.6	78.8	66.6	7672	87.6
2006	6846.7	880.0	94.6	75.6	93.1	73.3	88.8	67.4	8341	95.2
2007	3586.2	880.0	47.2	74.7	46.8	72.4	46.5	66.7	4217	48.1
2008	6790.4	880.0	88.5	75.1	87.7	72.9	87.8	67.4	7891	89.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1979 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		82			615	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	792			1135	21	
D. Inspection, maintenance or repair without refuelling				105		
E. Testing of plant systems or component:	20			11	0	
H. Nuclear regulatory requirement						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					9	31
L. Human factor related					5	
Z. Others					3	
Subtotal	812	82	0	1251	661	32
Total		894			1944	

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

System	2008 Hours Lost	1979 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		273
12. Reactor I&C Systems		21
13. Reactor Auxiliary System:		3
14. Safety Systems		11
15. Reactor Cooling System:		24
16. Steam generation system:		63
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries	33	33
32. Feedwater and Main Steam System		10
33. Circulating Water System		3
35. All other I&C Systems		4
41. Main Generator System:		37
42. Electrical Power Supply System:	49	123
XX. Miscellaneous Systems		0
Total	82	607

## FR-16 BUGEY-5

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6302.5 GW(e).h  
**Energy Availability Factor:** 84.3%  
**Load Factor:** 81.5%  
**Operating Factor:** 89.0%  
**Energy Unavailability Factor:** 15.7%  
**Total Off-line Time:** 962 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	620.5	551.7	632.0	570.6	543.0	502.8	574.2	518.2	229.2	329.0	582.3	649.0	6302.5
<b>EAF (%)</b>	96.6	92.7	97.5	91.1	85.6	84.8	94.0	88.8	36.6	51.0	93.4	99.6	84.3
<b>UCF (%)</b>	98.9	94.2	100.0	94.7	88.5	93.9	96.3	92.1	40.1	51.2	93.6	100.0	87.0
<b>LF (%)</b>	94.8	90.1	96.5	90.1	82.9	79.4	87.7	79.1	36.2	50.2	91.9	99.1	81.5
<b>OF (%)</b>	100.0	96.1	99.9	100.0	96.8	93.9	96.8	89.8	40.6	59.0	95.4	100.0	89.0
<b>EUF (%)</b>	3.4	7.3	2.5	8.9	14.4	15.2	6.0	11.2	63.4	49.0	6.6	0.4	15.7
<b>PUF (%)</b>	0.0	2.6	0.0	0.1	0.0	0.0	0.1	0.1	59.9	44.7	0.0	0.0	8.9
<b>UCLF (%)</b>	1.1	3.1	0.0	5.2	11.5	6.1	3.6	7.7	0.0	4.1	6.4	0.0	4.1
<b>XUF (%)</b>	2.3	1.5	2.4	3.6	2.9	9.1	2.3	3.4	3.5	0.2	0.2	0.4	2.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jul 1974	<b>Lifetime Generation:</b>	158298.5 GW(e).h
<b>Date of First Criticality:</b>	15 Jul 1979	<b>Cumulative Energy Availability Factor:</b>	75.7%
<b>Date of Grid Connection:</b>	31 Jul 1979	<b>Cumulative Load Factor:</b>	69.7%
<b>Date of Commercial Operation:</b>	03 Jan 1980	<b>Cumulative Unit Capability Factor:</b>	78.0%
		<b>Cumulative Energy Unavailability Factor:</b>	24.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	6589.0	900.0	84.5	84.5	84.5	84.5	83.3	83.3	8050	91.6
1981	4869.3	900.0	62.7	73.6	62.7	73.6	61.8	72.6	6061	69.2
1982	5738.5	900.0	76.4	74.5	76.4	74.5	72.8	72.6	6956	79.4
1983	5578.0	900.0	73.9	74.4	73.9	74.4	70.8	72.2	6649	75.9
1984	5778.0	900.0	74.1	74.3	74.1	74.3	73.1	72.4	6884	78.4
1985	6079.7	900.0	84.6	76.0	80.5	75.4	77.1	73.1	7314	83.5
1986	5465.5	900.0	75.7	76.0	75.5	75.4	69.3	72.6	6493	74.1
1987	5015.9	900.0	67.8	75.0	66.6	74.3	63.6	71.5	6044	69.0
1988	5466.0	900.0	89.7	76.6	84.6	75.4	69.1	71.2	6465	73.6
1989	4758.0	900.0	68.8	75.8	64.7	74.4	60.3	70.1	6185	70.6
1990	5586.0	880.0	80.7	76.3	74.9	74.4	72.5	70.3	7156	81.7
1991	3358.4	880.0	47.9	73.9	44.0	71.9	43.6	68.2	4258	48.6
1992	4035.0	880.0	56.4	72.6	52.5	70.5	52.2	66.9	5003	57.0
1993	4416.6	880.0	60.5	71.8	57.4	69.5	57.3	66.3	5329	60.8
1994	4487.3	880.0	85.9	72.7	85.7	70.6	58.2	65.7	6311	72.0
1995	5582.8	880.0	79.9	73.1	78.0	71.1	72.4	66.1	7060	80.6
1996	5361.4	880.0	79.0	73.5	77.5	71.4	69.4	66.3	6844	77.9
1997	5592.9	880.0	88.0	74.3	84.3	72.1	72.6	66.7	7302	83.4
1998	5320.4	880.0	83.9	74.8	80.5	72.6	69.0	66.8	6844	78.1
1999	6108.8	880.0	86.8	75.4	82.7	73.1	79.2	67.4	7679	87.7
2000	5403.2	880.0	77.3	75.5	74.6	73.1	69.9	67.5	6889	78.4
2001	4358.6	880.0	77.9	75.6	72.1	73.1	56.5	67.0	5604	64.0
2002	6146.9	900.0	91.2	76.3	91.2	73.9	78.0	67.5	7925	90.5
2003	5711.1	880.0	83.5	76.6	80.0	74.1	74.1	67.8	7220	82.4
2004	5256.1	880.0	72.7	76.4	71.4	74.0	68.0	67.8	6438	73.3
2005	7022.8	880.0	98.9	77.3	97.5	74.9	91.1	68.7	8573	97.9
2006	6118.1	880.0	88.5	77.7	86.6	75.4	79.4	69.1	7765	88.6
2007	5752.9	880.0	77.4	77.7	75.1	75.3	74.6	69.3	7051	80.5
2008	6302.5	880.0	87.0	78.0	84.3	75.7	81.5	69.7	7822	89.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		162			348	
B. Refuelling without a maintenance outage					3	
C. Inspection, maintenance or repair combined with refuelling	708			1257	12	
D. Inspection, maintenance or repair without refuelling				22		
E. Testing of plant systems or component:	34			9	2	
H. Nuclear regulatory requirement					1	
J. Grid limitation, failure or grid unavailability			34			
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					52	38
L. Human factor related		33			11	0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			13			
P. Fire						5
Z. Others					10	
Subtotal	742	195	47	1288	439	43
Total		984			1770	

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	18	24
12. Reactor I&C Systems	12	50
13. Reactor Auxiliary Systems	12	8
14. Safety Systems		4
15. Reactor Cooling System		28
16. Steam generation system		148
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries	78	38
32. Feedwater and Main Steam System	5	7
33. Circulating Water System	36	1
41. Main Generator Systems		16
42. Electrical Power Supply System		9
XX. Miscellaneous Systems	1	1
Total	162	334

# FR-50 CATTENOM-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9022.9 GW(e).h  
 Energy Availability Factor: 79.2%  
 Load Factor: 79.0%  
 Operating Factor: 89.7%  
 Energy Unavailability Factor: 20.8%  
 Total Off-line Time: 904 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	715.1	144.1	383.7	899.7	864.6	788.7	869.3	869.9	854.7	883.5	858.2	891.4	9022.9
EAF (%)	73.9	16.5	41.2	96.1	89.4	84.5	89.9	89.9	91.3	91.2	91.7	92.2	79.2
UCF (%)	92.3	24.2	41.3	96.8	91.7	86.2	91.9	91.9	91.9	91.8	91.8	92.4	82.2
LF (%)	73.9	15.9	39.7	96.1	89.4	84.3	89.9	89.9	91.3	91.2	91.7	92.2	79.0
OF (%)	100.0	27.7	50.8	100.0	100.0	95.1	100.0	100.0	100.0	100.0	100.0	100.0	89.7
EUF (%)	26.1	83.5	58.8	3.9	10.6	15.5	10.1	10.1	8.7	8.8	8.3	7.8	20.8
PUF (%)	0.0	72.5	39.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
UCLF (%)	7.7	3.3	19.8	3.2	8.3	13.8	8.1	8.1	8.0	8.2	8.2	7.6	8.7
XUF (%)	18.3	7.7	0.1	0.7	2.3	1.7	2.0	2.0	0.6	0.6	0.1	0.2	3.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 29 Oct 1979      Lifetime Generation: 172040.7 GW(e).h  
 Date of First Criticality: 24 Oct 1986      Cumulative Energy Availability Factor: 73.0%  
 Date of Grid Connection: 13 Nov 1986      Cumulative Load Factor: 68.8%  
 Date of Commercial Operation: 01 Apr 1987      Cumulative Unit Capability Factor: 74.3%  
    Cumulative Energy Unavailability Factor: 27.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	5472.0	1265.0	69.5	69.5	68.8	68.8	65.5	65.5	4514	68.4
1988	5283.0	1300.0	47.8	57.0	47.4	56.4	46.3	54.4	4369	49.7
1989	6802.4	1300.0	60.3	58.2	60.3	57.8	59.7	56.4	5548	63.3
1990	7781.9	1300.0	75.7	62.9	75.3	62.5	68.3	59.6	6710	76.6
1991	1509.3	1300.0	13.5	52.4	13.5	52.2	13.3	49.8	1336	15.3
1992	7933.3	1300.0	71.5	55.8	71.0	55.5	69.5	53.2	6595	75.1
1993	6956.6	1300.0	63.5	56.9	61.5	56.3	61.1	54.4	5608	64.0
1994	6775.4	1300.0	64.1	57.8	64.0	57.3	59.5	55.0	6006	68.6
1995	6634.3	1300.0	59.8	58.1	59.5	57.6	58.3	55.4	6346	72.4
1996	9539.2	1300.0	87.5	61.1	87.3	60.6	83.5	58.3	7783	88.6
1997	8688.9	1300.0	84.1	63.2	81.4	62.6	76.3	60.0	7374	84.2
1998	9365.8	1300.0	85.9	65.2	85.7	64.5	82.2	61.9	7644	87.3
1999	8273.0	1300.0	79.8	66.3	76.3	65.5	72.6	62.7	7028	80.2
2000	8053.8	1300.0	81.0	67.4	78.1	66.4	70.5	63.3	6873	78.2
2001	9220.2	1300.0	96.4	69.3	96.4	68.4	81.0	64.5	8094	92.4
2002	8270.2	1300.0	79.4	70.0	79.2	69.1	72.6	65.0	7011	80.0
2003	8531.0	1300.0	80.4	70.6	78.4	69.7	74.9	65.6	7150	81.6
2004	9764.2	1300.0	96.9	72.1	96.4	71.2	85.5	66.7	8583	97.7
2005	9323.8	1300.0	89.1	73.0	83.2	71.8	81.9	67.5	7919	90.4
2006	7449.0	1300.0	71.5	72.9	68.6	71.7	65.4	67.4	6480	74.0
2007	9696.2	1300.0	94.0	73.9	92.4	72.7	85.1	68.3	8426	96.2
2008	9022.9	1300.0	82.2	74.3	79.2	73.0	79.0	68.8	7881	89.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		135			793	
B. Refuelling without a maintenance	721				5	
C. Inspection, maintenance or repair combined with refuelling				905	15	
D. Inspection, maintenance or repair without refuelling				47	8	
E. Testing of plant systems or component				66		
H. Nuclear regulatory requirement					7	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					65	
L. Human factor related		35			3	
Z. Others		12			0	
Subtotal	721	182	0	1018	896	1
Total		903			1915	

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	84	17
12. Reactor I&C Systems	5	38
13. Reactor Auxiliary System:		35
14. Safety Systems		9
15. Reactor Cooling System:		88
16. Steam generation system:		36
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries		37
32. Feedwater and Main Steam System		90
33. Circulating Water System		20
41. Main Generator System:	17	371
42. Electrical Power Supply System:		14
XX. Miscellaneous Systems	29	5
Total	135	765



## FR-53 CATTENOM-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 7707.8 GW(e).h  
 Energy Availability Factor: 69.5%  
 Load Factor: 67.5%  
 Operating Factor: 72.4%  
 Energy Unavailability Factor: 30.5%  
 Total Off-line Time: 2429 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	931.8	858.6	945.3	834.5	388.1	0.0	0.0	135.8	905.4	916.4	861.4	930.3	7707.8
EAF (%)	99.7	99.7	98.5	89.2	40.7	0.0	0.0	14.5	98.2	99.0	96.2	99.9	69.5
UCF (%)	100.0	99.9	99.9	100.0	51.5	0.0	0.0	15.3	99.5	99.7	96.5	99.9	71.7
LF (%)	96.3	94.9	97.7	89.2	40.1	0.0	0.0	14.0	96.7	94.6	92.0	96.2	67.5
OF (%)	100.0	100.0	99.9	100.0	51.9	0.0	0.0	21.6	100.0	100.0	96.8	100.0	72.4
EUF (%)	0.3	0.3	1.5	10.8	59.3	100.0	100.0	85.5	1.8	1.0	3.8	0.1	30.5
PUF (%)	0.0	0.1	0.0	0.0	48.5	100.0	100.0	47.7	0.4	0.1	0.0	0.0	24.9
UCLF (%)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	37.1	0.1	0.2	3.5	0.0	3.5
XUF (%)	0.3	0.2	1.5	10.8	10.8	0.0	0.0	0.8	1.4	0.6	0.3	0.0	2.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 28 Jul 1980      Lifetime Generation: 174739.0 GW(e).h  
 Date of First Criticality: 07 Aug 1987      Cumulative Energy Availability Factor: 77.9%  
 Date of Grid Connection: 17 Sep 1987      Cumulative Load Factor: 72.6%  
 Date of Commercial Operation: 01 Feb 1988      Cumulative Unit Capability Factor: 79.9%  
    Cumulative Energy Unavailability Factor: 22.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	7457.0	1300.0	91.0	91.0	90.8	90.8	71.3	71.3	6588	81.9
1989	1765.5	1300.0	16.5	52.2	15.5	51.5	15.5	42.2	1452	16.6
1990	8137.6	1300.0	83.0	62.7	82.7	62.2	71.5	52.2	6670	76.1
1991	7543.1	1300.0	71.7	65.0	68.2	63.7	66.2	55.8	6472	73.9
1992	8134.3	1300.0	75.6	67.2	72.4	65.5	71.2	59.0	6752	76.9
1993	8627.0	1300.0	78.8	69.2	76.2	67.3	75.8	61.8	6990	79.8
1994	8526.3	1300.0	80.5	70.8	77.7	68.8	74.9	63.7	7158	81.7
1995	8603.7	1300.0	79.9	71.9	78.3	70.0	75.6	65.2	7138	81.5
1996	9018.1	1300.0	99.6	75.1	98.1	73.2	79.0	66.7	7804	88.8
1997	8487.4	1300.0	84.4	76.0	82.2	74.1	74.5	67.5	7503	85.7
1998	7259.5	1300.0	69.0	75.3	68.0	73.5	63.7	67.2	6144	70.1
1999	9367.5	1300.0	90.2	76.6	87.3	74.7	82.3	68.4	7781	88.8
2000	9164.3	1300.0	88.6	77.5	88.6	75.7	80.3	69.4	7868	89.6
2001	8649.0	1300.0	79.4	77.7	77.5	75.9	75.9	69.8	7033	80.3
2002	8288.0	1300.0	76.9	77.6	76.9	75.9	72.8	70.0	6918	79.0
2003	10197.5	1300.0	99.3	79.0	93.5	77.0	89.5	71.3	8217	93.8
2004	7368.2	1300.0	68.7	78.4	66.8	76.4	64.5	70.9	6183	70.4
2005	9247.8	1300.0	87.9	78.9	84.7	76.9	81.2	71.4	7845	89.6
2006	9870.3	1300.0	98.0	79.9	96.1	77.9	86.7	72.2	8626	98.5
2007	9526.5	1300.0	87.8	80.3	85.7	78.3	83.7	72.8	7758	88.6
2008	7707.8	1300.0	71.7	79.9	69.5	77.9	67.5	72.6	6356	72.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		300			470	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling	2123			881	7	
D. Inspection, maintenance or repair without refuelling				54	20	
E. Testing of plant systems or component:	1			55	0	2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					11	23
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			0
Z. Others					20	
Subtotal	2124	300	6	990	542	25
Total	2430			1557		

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems	24	6
13. Reactor Auxiliary Systems	8	9
14. Safety Systems		31
15. Reactor Cooling Systems	12	215
16. Steam generation system		89
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		16
33. Circulating Water System		2
35. All other I&C Systems		2
41. Main Generator Systems	232	2
42. Electrical Power Supply Systems		25
XX. Miscellaneous Systems	24	5
Total	300	429

## FR-60 CATTENOM-3

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 8712.7 GW(e).h  
 Energy Availability Factor: 78.4%  
 Load Factor: 76.3%  
 Operating Factor: 81.3%  
 Energy Unavailability Factor: 21.6%  
 Total Off-line Time: 1640 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	930.0	866.1	825.3	89.3	0.0	550.3	916.5	905.7	835.8	931.1	899.3	963.4	8712.7
EAF (%)	99.9	96.4	86.8	10.6	0.0	59.3	98.6	99.0	93.9	99.1	97.1	99.5	78.4
UCF (%)	100.0	100.0	100.0	13.3	0.0	61.2	99.8	99.9	94.4	99.6	97.3	99.6	80.5
LF (%)	96.2	95.7	85.3	9.5	0.0	58.8	94.8	93.6	89.3	96.1	96.1	99.6	76.3
OF (%)	100.0	100.0	99.9	13.6	0.0	67.2	100.0	100.0	94.9	100.0	100.0	100.0	81.3
EUF (%)	0.1	3.6	13.2	89.4	100.0	40.7	1.4	1.0	6.1	0.9	2.9	0.5	21.6
PUF (%)	0.0	0.0	0.0	86.7	3.5	5.9	0.0	0.1	0.1	0.0	0.0	0.0	7.9
UCLF (%)	0.0	0.0	0.0	0.0	96.5	32.9	0.2	0.0	5.5	0.3	2.7	0.4	11.6
XUF (%)	0.1	3.6	13.2	2.7	0.0	1.9	1.2	0.8	0.5	0.5	0.2	0.1	2.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 15 Jun 1982      Lifetime Generation: 155158.4 GW(e).h  
 Date of First Criticality: 16 Feb 1990      Cumulative Energy Availability Factor: 80.7%  
 Date of Grid Connection: 06 Jul 1990      Cumulative Load Factor: 75.0%  
 Date of Commercial Operation: 01 Feb 1991      Cumulative Unit Capability Factor: 82.7%  
    Cumulative Energy Unavailability Factor: 19.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1991	8931.1	1300.0	89.6	89.6	88.2	88.2	85.7	85.7	7255	90.5
1992	7145.0	1300.0	67.0	77.8	65.6	76.4	62.6	73.6	5903	67.2
1993	8035.1	1300.0	81.2	78.9	75.9	76.2	70.6	72.6	6858	78.3
1994	8613.3	1300.0	85.7	80.7	84.4	78.3	75.6	73.3	7464	85.2
1995	8344.3	1300.0	82.2	81.0	78.9	78.4	73.3	73.3	7269	83.0
1996	8264.7	1300.0	80.6	80.9	77.3	78.2	72.4	73.2	7184	81.8
1997	9504.1	1300.0	94.5	82.9	93.2	80.4	83.5	74.7	8097	92.4
1998	8054.9	1300.0	83.5	83.0	80.2	80.4	70.7	74.2	7175	81.9
1999	8237.0	1300.0	83.5	83.0	79.7	80.3	72.3	74.0	7169	81.8
2000	8933.5	1300.0	99.1	84.6	98.7	82.2	78.2	74.4	7984	90.9
2001	3171.5	1300.0	29.8	79.6	29.7	77.4	27.8	70.1	2739	31.3
2002	9402.5	1300.0	83.6	80.0	82.5	77.8	82.6	71.2	7443	85.0
2003	11254.0	1300.0	99.3	81.5	98.4	79.4	98.8	73.3	8715	99.5
2004	9162.7	1300.0	81.4	81.5	80.3	79.5	80.2	73.8	7274	82.8
2005	9757.0	1300.0	89.2	82.0	86.7	79.9	85.7	74.6	7944	90.7
2006	8045.3	1300.0	79.9	81.8	76.5	79.7	70.6	74.4	7088	80.9
2007	9500.6	1300.0	99.3	82.9	98.5	80.8	83.4	74.9	8559	97.7
2008	8712.7	1300.0	80.5	82.7	78.4	80.7	76.3	75.0	7145	81.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		985			198	3
B. Refuelling without a maintenance outage					0	
C. Inspection, maintenance or repair combined with refuelling	648			782	18	
D. Inspection, maintenance or repair without refuelling				63		
E. Testing of plant systems or component	1			16		
H. Nuclear regulatory requirement					109	
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					36	9
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.)			7			
Z. Others					1	
Subtotal	649	985	7	861	367	14
Total		1641			1242	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		33
13. Reactor Auxiliary System	13	53
14. Safety Systems		15
15. Reactor Cooling System		12
16. Steam generation system		11
21. Fuel Handling and Storage Facilities		9
31. Turbine and auxiliaries	7	22
32. Feedwater and Main Steam System	59	4
41. Main Generator System	906	10
42. Electrical Power Supply System		6
XX. Miscellaneous Systems		3
Total	985	178

# FR-65 CATTENOM-4

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9538.8 GW(e).h  
 Energy Availability Factor: 87.9%  
 Load Factor: 83.5%  
 Operating Factor: 90.8%  
 Energy Unavailability Factor: 12.1%  
 Total Off-line Time: 809 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	932.0	868.4	911.9	890.4	890.0	838.7	860.6	895.1	828.8	248.5	460.2	914.4	9538.8
EAF (%)	99.8	99.4	97.7	99.5	98.6	98.2	98.9	97.3	88.5	26.3	51.0	99.8	87.9
UCF (%)	100.0	100.0	97.8	99.7	99.5	98.8	99.4	99.7	100.0	32.2	51.1	100.0	89.8
LF (%)	96.4	96.0	94.3	95.1	92.0	89.6	89.0	92.5	88.5	25.7	49.2	94.5	83.5
OF (%)	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	32.5	57.5	100.0	90.8
EUF (%)	0.2	0.6	2.3	0.5	1.4	1.8	1.1	2.7	11.5	73.7	49.0	0.2	12.1
PUF (%)	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	67.8	33.1	0.0	8.5
UCLF (%)	0.0	0.0	2.1	0.3	0.4	1.1	0.6	0.3	0.0	0.0	15.8	0.0	1.7
XUF (%)	0.1	0.6	0.1	0.2	0.9	0.7	0.6	2.4	11.5	5.9	0.1	0.2	1.9

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 28 Sep 1983      Lifetime Generation: 153728.4 GW(e).h  
 Date of First Criticality: 04 May 1991      Cumulative Energy Availability Factor: 83.9%  
 Date of Grid Connection: 27 May 1991      Cumulative Load Factor: 78.3%  
 Date of Commercial Operation: 01 Jan 1992      Cumulative Unit Capability Factor: 85.5%  
    Cumulative Energy Unavailability Factor: 16.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1992	9356.0	1300.0	88.0	88.0	85.8	85.8	81.9	81.9	7649	87.1
1993	7736.4	1300.0	79.1	83.6	78.0	81.9	67.9	74.9	6251	71.4
1994	7828.8	1300.0	81.9	83.0	80.4	81.4	68.7	72.9	6866	78.4
1995	8942.4	1300.0	85.5	83.6	82.8	81.8	78.5	74.3	7563	86.3
1996	8897.6	1300.0	82.6	83.4	81.3	81.7	77.9	75.0	7399	84.2
1997	8690.5	1300.0	82.6	83.3	79.3	81.3	76.3	75.2	7382	84.3
1998	10000.1	1300.0	96.1	85.1	94.5	83.2	87.8	77.0	8476	96.8
1999	8131.9	1300.0	82.9	84.8	80.8	82.9	71.4	76.3	7164	81.8
2000	9139.0	1300.0	86.6	85.0	85.1	83.1	80.0	76.7	7692	87.6
2001	8593.2	1300.0	86.6	85.2	84.8	83.3	75.5	76.6	7375	84.2
2002	10598.8	1300.0	95.3	86.1	95.1	84.4	93.1	78.1	8467	96.7
2003	7708.3	1300.0	72.1	84.9	69.8	83.1	67.7	77.2	6406	73.1
2004	9311.8	1300.0	85.0	84.9	84.5	83.2	81.5	77.6	7560	86.1
2005	9913.9	1300.0	98.3	85.9	97.8	84.3	87.1	78.2	8520	97.3
2006	8719.6	1300.0	83.5	85.7	80.6	84.0	76.6	78.1	7440	84.9
2007	8562.2	1300.0	78.4	85.3	77.1	83.6	75.2	78.0	6999	79.9
2008	9538.8	1300.0	89.8	85.5	87.9	83.9	83.5	78.3	7975	90.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1991 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		37			166	2
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	697			840	36	
D. Inspection, maintenance or repair without refuelling				63		
E. Testing of plant systems or component:	2			63		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	36
L. Human factor related		74			17	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.			2			
Subtotal	699	111	2	966	223	52
Total		812			1241	

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

System	2008 Hours Lost	1991 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		13
13. Reactor Auxiliary System:		6
14. Safety Systems		38
16. Steam generation system:		3
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries	5	23
32. Feedwater and Main Steam System		14
33. Circulating Water System		1
41. Main Generator System:		19
42. Electrical Power Supply System:	6	17
XX. Miscellaneous Systems	26	
Total	37	144

# FR-40 CHINON-B-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power  
at the beginning of 2008: 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 2008

Net Energy Production: 6893.1 GW(e).h

Energy Availability Factor: 86.8%

Load Factor: 86.9%

Operating Factor: 89.7%

Energy Unavailability Factor: 13.2%

Total Off-line Time: 898 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	668.2	623.0	662.4	645.1	658.0		51.3	653.1	589.5	646.7	626.1	668.5	6893.1
EAF (%)	99.2	98.9	98.5	99.0	97.7		9.0	97.0	90.7	95.9	96.1	99.3	86.8
UCF (%)	99.5	99.3	99.3	99.4	99.3		9.0	99.3	91.8	96.4	98.7	99.4	88.0
LF (%)	99.2	102.4	98.4	99.1	97.7		7.6	97.0	90.5	95.9	96.1	99.3	86.9
OF (%)	100.0	103.3	99.9	100.1	100.0		13.7	100.0	94.7	100.0	100.0	100.0	89.7
EUf (%)	0.8	1.1	1.5	1.0	2.3		91.0	3.0	9.3	4.1	3.9	0.7	13.2
PUf (%)	0.0	0.0	0.1	0.0	0.2		76.0	0.2	0.0	0.1	0.4	0.0	9.3
UCLF (%)	0.4	0.7	0.6	0.6	0.5		15.1	0.6	8.1	3.5	1.0	0.6	2.7
XUF (%)	0.3	0.4	0.8	0.3	1.5		0.0	2.3	1.1	0.5	2.6	0.1	1.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

BASE LOAD

## 5. Historical Summary

Date of Construction Start: 01 Mar 1977      Lifetime Generation: 149496.3 GW(e).h

Date of First Criticality: 28 Oct 1982      Cumulative Energy Availability Factor: 78.7%

Date of Grid Connection: 30 Nov 1982      Cumulative Load Factor: 74.2%

Date of Commercial Operation: 01 Feb 1984      Cumulative Unit Capability Factor: 79.9%

   Cumulative Energy Unavailability Factor: 21.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	3925.0	870.0	57.6	57.6	57.6	57.6	56.1	56.1	4835	60.1
1985	5978.2	870.0	84.5	71.6	82.1	70.4	78.4	67.8	7402	84.5
1986	6322.2	870.0	86.1	76.6	86.1	75.7	83.0	73.0	7609	86.9
1987	4914.1	870.0	73.7	75.8	72.9	75.0	64.5	70.8	6438	73.5
1988	5271.0	870.0	97.4	80.2	96.2	79.3	69.0	70.4	7195	81.9
1989	4734.3	870.0	64.4	77.5	63.6	76.7	62.1	69.0	5724	65.3
1990	5913.0	870.0	79.3	77.8	79.1	77.0	77.6	70.3	7043	80.4
1991	5339.2	905.0	68.0	76.5	67.7	75.8	67.3	69.9	6033	68.9
1992	5972.0	905.0	80.9	77.0	80.6	76.4	75.1	70.5	7133	81.2
1993	5651.7	905.0	77.7	77.1	73.3	76.0	71.3	70.6	6914	78.9
1994	5366.3	905.0	71.9	76.6	71.4	75.6	67.7	70.3	6347	72.5
1995	6333.9	905.0	85.6	77.4	84.4	76.4	79.9	71.1	7573	86.4
1996	6295.2	905.0	83.6	77.9	83.4	76.9	79.2	71.8	7476	85.1
1997	6093.3	905.0	81.9	78.2	81.8	77.3	76.9	72.1	7268	83.0
1998	6631.3	905.0	87.1	78.8	85.7	77.8	83.6	72.9	7759	88.6
1999	6214.0	905.0	84.3	79.1	82.1	78.1	78.4	73.3	7483	85.4
2000	6166.8	905.0	83.6	79.4	82.7	78.4	77.6	73.5	7416	84.4
2001	5769.0	905.0	82.6	79.6	81.2	78.5	72.8	73.5	7260	82.9
2002	6229.3	920.0	88.8	80.1	85.6	78.9	77.3	73.7	7671	87.6
2003	5181.7	905.0	71.0	79.6	68.4	78.4	65.4	73.3	6357	72.6
2004	6252.6	905.0	83.7	79.8	83.7	78.6	78.7	73.5	7536	85.8
2005	6465.8	905.0	84.5	80.0	83.9	78.9	81.5	73.9	7611	86.9
2006	6637.8	905.0	87.3	80.4	86.7	79.2	83.7	74.3	7873	89.9
2007	4538.8	905.0	61.0	79.5	57.7	78.3	57.3	73.6	5559	63.5
2008	6893.1	905.0	88.0	79.9	86.8	78.7	86.9	74.2	7862	89.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		60			362	
B. Refuelling without a maintenance				9	4	
C. Inspection, maintenance or repair combined with refuelling	770			1054	63	
E. Testing of plant systems or component				7	1	
H. Nuclear regulatory requirement					4	
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					50	
L. Human factor related		93			8	
Z. Others					1	
Subtotal	770	153	0	1070	493	4
Total		923			1567	

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		27
14. Safety Systems		17
15. Reactor Cooling Systems		12
16. Steam generation system		11
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	2	135
32. Feedwater and Main Steam System		12
41. Main Generator Systems	19	64
42. Electrical Power Supply Systems	39	29
XX. Miscellaneous Systems		5
Total	60	323



## FR-41 CHINON-B-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power  
at the beginning of 2008: 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 2008

Net Energy Production: 5038.3 GW(e).h

Energy Availability Factor: 64.1%

Load Factor: 63.6%

Operating Factor: 66.8%

Energy Unavailability Factor: 35.9%

Total Off-line Time: 2908 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	665.4	611.0	647.2	617.9	593.5	624.7	641.5	455.6		0.0	0.0	181.4	5038.3
EAF (%)	98.6	96.8	97.1	96.0	91.5	97.9	96.2	68.1		0.0	0.0	28.7	64.1
UCF (%)	98.8	96.9	97.4	96.3	92.6	99.2	99.2	70.3		0.0	0.0	28.7	64.9
LF (%)	98.8	100.5	96.1	95.0	88.1	95.9	95.3	67.7		0.0	0.0	26.9	63.6
OF (%)	100.0	103.6	97.6	100.1	93.4	100.0	100.0	71.1		0.0	0.0	37.4	66.8
EUF (%)	1.4	3.2	2.9	4.0	8.5	2.1	3.8	31.9		100.0	100.0	71.3	35.9
PUF (%)	0.1	0.0	0.1	0.0	0.0	0.1	0.1	29.2		45.4	0.0	8.7	15.3
UCLF (%)	1.1	3.0	2.6	3.7	7.4	0.7	0.7	0.5		54.6	100.0	62.6	19.8
XUF (%)	0.1	0.1	0.3	0.3	1.1	1.3	3.0	2.2		0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Mar 1977      Lifetime Generation: 142353.3 GW(e).h

Date of First Criticality: 23 Sep 1983      Cumulative Energy Availability Factor: 78.2%

Date of Grid Connection: 29 Nov 1983      Cumulative Load Factor: 73.1%

Date of Commercial Operation: 01 Aug 1984      Cumulative Unit Capability Factor: 79.4%

   Cumulative Energy Unavailability Factor: 21.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	2423.0	870.0	91.7	91.7	91.7	91.7	75.8	75.8	2985	81.3
1985	5037.4	870.0	69.3	75.9	67.9	74.9	66.1	69.0	6201	70.8
1986	6215.1	870.0	86.4	80.3	86.0	79.5	81.6	74.2	7639	87.2
1987	5618.8	870.0	81.1	80.5	80.7	79.9	73.7	74.0	7171	81.9
1988	4425.0	870.0	68.4	77.8	67.3	77.0	57.9	70.4	5731	65.2
1989	6043.4	870.0	94.4	80.8	91.2	79.6	79.3	72.0	7873	89.9
1990	5217.0	870.0	84.4	81.4	84.1	80.3	68.5	71.5	6714	76.6
1991	3142.2	870.0	55.8	77.9	53.2	76.7	41.2	67.4	3921	44.8
1992	6295.4	870.0	82.0	78.4	80.8	77.2	82.4	69.2	7321	83.3
1993	5491.6	870.0	81.4	78.7	76.2	77.1	72.1	69.5	6867	78.4
1994	6174.6	905.0	84.7	79.3	83.9	77.7	77.9	70.3	7407	84.6
1995	6356.3	905.0	86.1	79.9	86.0	78.5	80.2	71.2	7741	88.4
1996	5287.6	905.0	69.6	79.1	69.4	77.7	66.5	70.8	6206	70.7
1997	6637.9	905.0	86.5	79.7	85.2	78.3	83.7	71.8	7622	87.0
1998	6186.4	905.0	80.4	79.7	79.9	78.4	78.0	72.3	7136	81.5
1999	5900.9	905.0	79.1	79.7	79.0	78.5	74.4	72.4	7075	80.8
2000	6177.0	905.0	81.2	79.8	80.8	78.6	77.7	72.7	7260	82.7
2001	6646.2	905.0	88.5	80.3	87.5	79.1	83.8	73.4	7846	89.6
2002	6155.6	920.0	86.4	80.6	85.6	79.5	76.4	73.5	7404	84.5
2003	5746.2	905.0	81.3	80.7	78.7	79.4	72.5	73.5	7163	81.8
2004	6133.4	905.0	80.9	80.7	80.6	79.5	77.2	73.7	7252	82.6
2005	6659.6	905.0	88.0	81.0	86.5	79.8	84.0	74.2	7882	90.0
2006	4548.8	905.0	61.4	80.1	60.1	78.9	57.4	73.4	5503	62.8
2007	5965.9	905.0	77.9	80.0	76.6	78.8	75.3	73.5	7023	80.2
2008	5038.3	905.0	64.9	79.4	64.1	78.2	63.6	73.1	5852	66.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1610			422	
B. Refuelling without a maintenance				71	6	
C. Inspection, maintenance or repair combined with refuelling	1273			956	10	
D. Inspection, maintenance or repair without refuelling				3		
E. Testing of plant systems or component	0			17	1	
H. Nuclear regulatory requirement		24			18	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					11	48
L. Human factor related		24			16	
Z. Others					5	
Subtotal	1273	1658	0	1047	489	48
Total		2931			1584	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		15
12. Reactor I&C Systems		13
13. Reactor Auxiliary System:	168	29
14. Safety Systems		30
15. Reactor Cooling System:		64
16. Steam generation system:	1376	5
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries		67
32. Feedwater and Main Steam System		20
33. Circulating Water System	49	3
35. All other I&C Systems	14	1
41. Main Generator System:	3	30
42. Electrical Power Supply System:		57
XX. Miscellaneous Systems		3
Total	1610	340

## FR-56 CHINON-B-3

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 6498.1 GW(e).h  
 Energy Availability Factor: 82.3%  
 Load Factor: 82.0%  
 Operating Factor: 88.6%  
 Energy Unavailability Factor: 17.7%  
 Total Off-line Time: 1000 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	651.8	590.5	641.7	558.9	625.4	612.8	485.3	0.0	501.0	591.6	603.3	635.8	6498.1
EAF (%)	97.3	94.0	97.0	86.7	94.3	94.5	72.4	0.0	77.3	88.4	92.7	94.4	82.3
UCF (%)	97.4	94.1	97.2	87.0	95.8	96.1	80.9	0.0	78.0	89.0	93.3	94.5	83.5
LF (%)	96.8	97.1	95.3	85.9	92.9	94.0	72.1	0.0	76.9	87.7	92.6	94.4	82.0
OF (%)	100.0	103.6	99.9	92.9	100.0	100.0	81.0	0.0	87.9	100.0	100.0	100.0	88.6
EUF (%)	2.7	6.0	3.0	13.3	5.7	5.5	27.6	100.0	22.7	11.6	7.3	5.6	17.7
PUF (%)	0.1	0.0	0.1	0.1	0.0	0.2	19.1	64.5	7.5	0.0	0.1	0.1	7.8
UCLF (%)	2.5	5.9	2.7	12.9	4.1	3.7	0.0	35.5	14.6	10.9	6.6	5.4	8.8
XUF (%)	0.1	0.1	0.2	0.3	1.6	1.6	8.5	0.0	0.6	0.7	0.6	0.1	1.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Oct 1980      Lifetime Generation: 128776.2 GW(e).h  
 Date of First Criticality: 18 Sep 1986      Cumulative Energy Availability Factor: 79.4%  
 Date of Grid Connection: 20 Oct 1986      Cumulative Load Factor: 73.6%  
 Date of Commercial Operation: 04 Mar 1987      Cumulative Unit Capability Factor: 81.1%  
    Cumulative Energy Unavailability Factor: 20.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	3322.3	870.0	67.6	67.6	67.6	67.6	52.0	52.0	4383	59.7
1988	4413.0	905.0	61.5	64.2	58.9	62.8	55.5	53.9	5354	61.0
1989	5028.6	905.0	81.2	70.3	77.8	68.1	63.4	57.3	6125	69.9
1990	5417.6	905.0	69.2	70.0	69.1	68.4	68.3	60.2	6274	71.6
1991	7026.4	905.0	92.9	74.7	90.7	73.0	88.6	66.1	8204	93.7
1992	6091.5	905.0	87.5	76.9	85.6	75.2	76.6	67.9	7468	85.0
1993	5600.7	905.0	78.3	77.1	72.6	74.8	70.6	68.3	6827	77.9
1994	5064.0	905.0	76.2	77.0	75.5	74.9	63.9	67.8	6325	72.2
1995	6005.6	905.0	83.3	77.7	82.5	75.8	75.8	68.7	7177	81.9
1996	6278.0	905.0	87.2	78.7	86.9	76.9	79.0	69.7	7761	88.4
1997	5816.8	905.0	85.1	79.3	85.1	77.7	73.4	70.1	7249	82.8
1998	6345.6	905.0	84.1	79.7	81.3	78.0	80.0	70.9	7472	85.3
1999	5602.0	905.0	74.8	79.3	72.2	77.5	70.7	70.9	6656	76.0
2000	6330.1	905.0	83.1	79.6	82.5	77.9	79.6	71.5	7386	84.1
2001	6318.0	905.0	87.0	80.1	84.8	78.3	79.7	72.1	7665	87.5
2002	6720.4	920.0	90.1	80.7	87.6	78.9	83.4	72.8	7971	91.0
2003	5807.7	905.0	77.7	80.6	77.6	78.9	73.3	72.8	6954	79.4
2004	5784.4	905.0	82.5	80.7	82.3	79.1	72.8	72.8	7444	84.7
2005	5595.4	905.0	79.1	80.6	76.5	78.9	70.6	72.7	7287	83.2
2006	6369.7	905.0	89.0	81.0	86.3	79.3	80.3	73.1	7930	90.5
2007	6061.3	905.0	80.2	81.0	77.9	79.2	76.5	73.3	7310	83.4
2008	6498.1	905.0	83.5	81.1	82.3	79.4	82.0	73.6	7760	88.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		319			323	
B. Refuelling without a maintenance	549			29	3	
C. Inspection, maintenance or repair combined with refuelling	72			886	33	
D. Inspection, maintenance or repair without refuelling				40		
E. Testing of plant systems or component:	0			35	2	
H. Nuclear regulatory requirement		84			11	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					18	
L. Human factor related					10	
Z. Others					4	
Subtotal	621	403	0	990	404	0
Total		1024			1394	

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		33
12. Reactor I&C Systems		5
13. Reactor Auxiliary System:		38
14. Safety Systems		2
15. Reactor Cooling System:		32
16. Steam generation system:	267	0
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	49	77
32. Feedwater and Main Steam System	3	31
33. Circulating Water System		3
41. Main Generator System:		32
42. Electrical Power Supply System:		6
XX. Miscellaneous Systems:		0
Total	319	260

## FR-57 CHINON-B-4

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 5863.5 GW(e).h  
 Energy Availability Factor: 75.6%  
 Load Factor: 74.0%  
 Operating Factor: 78.6%  
 Energy Unavailability Factor: 24.4%  
 Total Off-line Time: 1879 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	660.7	616.5	647.4				295.1	616.2	615.8	646.5	633.0	663.9	5863.5
EAF (%)	99.4	99.7	96.8				45.2	99.1	99.1	99.3	98.8	98.6	75.6
UCF (%)	99.7	99.8	99.9				45.8	100.0	99.9	99.8	99.6	98.8	77.1
LF (%)	98.1	101.4	96.1				43.8	91.5	94.5	95.9	97.1	98.6	74.0
OF (%)	100.0	103.6	99.9				57.0	100.0	100.0	100.0	100.0	100.0	78.6
EUF (%)	0.6	0.3	3.2				54.8	0.9	0.9	0.7	1.2	1.4	24.4
PUF (%)	0.2	0.1	0.0				17.0	0.0	0.0	0.1	0.1	0.1	19.6
UCLF (%)	0.2	0.1	0.0				37.3	0.0	0.1	0.1	0.4	1.2	3.3
XUF (%)	0.2	0.2	3.2				0.5	0.9	0.8	0.5	0.8	0.1	1.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Feb 1981      Lifetime Generation: 124016.7 GW(e).h  
 Date of First Criticality: 13 Oct 1987      Cumulative Energy Availability Factor: 80.3%  
 Date of Grid Connection: 14 Nov 1987      Cumulative Load Factor: 74.7%  
 Date of Commercial Operation: 01 Apr 1988      Cumulative Unit Capability Factor: 82.0%  
    Cumulative Energy Unavailability Factor: 19.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	3367.0	905.0	89.0	89.0	86.2	86.2	56.4	56.4	4475	67.8
1989	4688.1	905.0	63.6	74.5	60.4	71.5	59.1	57.9	5664	64.7
1990	6098.0	905.0	77.2	75.5	77.0	73.5	76.9	64.8	7003	79.9
1991	6340.0	905.0	80.0	76.7	79.2	75.0	80.0	68.9	7204	82.2
1992	6388.0	905.0	85.0	78.4	82.8	76.7	80.4	71.3	7544	85.9
1993	6016.9	905.0	85.8	79.7	80.1	77.3	75.9	72.1	7359	84.0
1994	5935.1	905.0	82.4	80.1	81.2	77.8	74.9	72.5	7196	82.1
1995	6566.0	905.0	88.2	81.2	87.9	79.1	82.8	73.8	7805	89.1
1996	6574.2	905.0	87.6	81.9	87.0	80.0	82.7	74.8	7764	88.4
1997	6345.4	905.0	88.7	82.6	85.6	80.6	80.0	75.4	7795	89.0
1998	5940.1	905.0	83.1	82.7	80.2	80.6	74.9	75.3	7326	83.6
1999	5596.3	905.0	89.9	83.3	88.2	81.2	70.6	74.9	7059	80.6
2000	5110.7	905.0	74.1	82.5	72.9	80.6	64.3	74.1	6445	73.4
2001	5765.0	905.0	81.3	82.5	79.9	80.5	72.7	74.0	7078	80.8
2002	6321.3	920.0	85.8	82.7	84.3	80.8	78.4	74.3	7584	86.6
2003	6431.8	905.0	87.7	83.0	86.6	81.2	81.1	74.7	7811	89.2
2004	5513.2	905.0	75.1	82.5	74.9	80.8	69.4	74.4	6883	78.4
2005	5356.4	905.0	71.1	81.9	69.7	80.2	67.6	74.0	7030	80.3
2006	6369.0	905.0	84.4	82.0	83.3	80.3	80.3	74.4	7558	86.3
2007	6485.7	905.0	86.1	82.2	84.8	80.5	81.8	74.7	7691	87.8
2008	5863.5	905.0	77.1	82.0	75.6	80.3	74.0	74.7	6881	78.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		255			298	
B. Refuelling without a maintenance				41	0	
C. Inspection, maintenance or repair combined with refuelling	1648			759	95	
E. Testing of plant systems or component:	0			29		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	21	26
L. Human factor related					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.					6	
Z. Others					13	
Subtotal	1648	255	0	829	435	26
Total		1903			1290	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	50	25
12. Reactor I&C Systems	43	17
13. Reactor Auxiliary System:	66	35
14. Safety Systems		6
15. Reactor Cooling System:		57
16. Steam generation system:	30	1
21. Fuel Handling and Storage Facilities	53	0
31. Turbine and auxiliaries:	13	29
32. Feedwater and Main Steam System		15
33. Circulating Water System		7
35. All other I&C Systems:		1
41. Main Generator System:		53
42. Electrical Power Supply System:		18
XX. Miscellaneous Systems:		1
Total	255	265

# FR-62 CHOOZ-B-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 12376.7 GW(e).h  
 Energy Availability Factor: 95.0%  
 Load Factor: 93.9%  
 Operating Factor: 97.6%  
 Energy Unavailability Factor: 5.0%  
 Total Off-line Time: 213 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1118.5	1043.6	1115.5	1077.8	874.4	1064.2	1014.5	1063.2	1014.7	1072.0	1021.3	897.2	12376.7
EAF (%)	100.0	100.0	100.0	100.0	84.9	99.8	92.7	97.0	95.2	96.2	94.6	80.5	95.0
UCF (%)	100.0	100.0	100.0	100.0	84.9	100.0	96.7	97.2	95.3	96.3	98.8	95.4	97.0
LF (%)	100.2	100.0	100.0	99.8	78.4	98.5	90.9	95.3	94.0	95.9	94.6	80.4	93.9
OF (%)	100.0	100.0	99.9	100.0	82.1	100.0	93.4	100.0	100.0	100.0	100.0	96.0	97.6
EUF (%)	0.0	0.0	0.0	0.0	15.1	0.2	7.3	3.0	4.8	3.8	5.4	19.5	5.0
PUF (%)	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 (%)	0.0	0.0	0.0	0.0	15.1	0.0	3.3	2.8	4.8	3.7	1.2	4.6	3.0
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.2	4.0	0.1	0.0	0.0	4.3	14.9	2.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Jan 1984      Lifetime Generation: 101723.2 GW(e).h  
 Date of First Criticality: 25 Jul 1996      Cumulative Energy Availability Factor: 81.9%  
 Date of Grid Connection: 30 Aug 1996      Cumulative Load Factor: 79.5%  
 Date of Commercial Operation: 15 May 2000      Cumulative Unit Capability Factor: 83.9%  
    Cumulative Energy Unavailability Factor: 18.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2000	8420.9	1455.0	96.9	96.9	96.9	96.9	98.4	98.4	5711	97.1
2001	9524.4	1455.0	78.0	85.6	75.0	83.8	74.7	84.2	6800	77.6
2002	9515.1	1455.0	82.4	84.4	81.0	82.7	74.7	80.7	6807	77.7
2003	10021.9	1500.0	89.4	85.8	85.6	83.5	76.3	79.4	7219	82.4
2004	10671.1	1500.0	86.7	86.0	83.6	83.6	81.0	79.8	7657	87.2
2005	9047.7	1500.0	70.5	83.2	69.6	81.1	68.8	77.8	6285	71.7
2006	9845.7	1500.0	77.6	82.4	75.6	80.2	74.9	77.4	6885	78.6
2007	10402.3	1500.0	80.7	82.1	79.6	80.2	79.2	77.6	7154	81.7
2008	12376.7	1500.0	97.0	83.9	95.0	81.9	93.9	79.5	8572	97.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1997 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		160			911	
B. Refuelling without a maintenance				113		
C. Inspection, maintenance or repair combined with refuelling				442		
E. Testing of plant systems or component				146		
H. Nuclear regulatory requirement					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			30			7
L. Human factor related					91	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						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.)			26			
Z. Others					28	
Subtotal	0	160	56	701	1031	21
Total		216			1753	

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

System	2008 Hours Lost	1997 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		73
13. Reactor Auxiliary System		24
15. Reactor Cooling System		74
16. Steam generation system		12
31. Turbine and auxiliaries	22	590
32. Feedwater and Main Steam System	107	1
41. Main Generator System	31	0
42. Electrical Power Supply System		80
XX. Miscellaneous Systems		5
Total	160	863



## FR-70 CHOOZ-B-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 11038.9 GW(e).h  
 Energy Availability Factor: 84.6%  
 Load Factor: 83.8%  
 Operating Factor: 87.0%  
 Energy Unavailability Factor: 15.4%  
 Total Off-line Time: 1146 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1007.6	432.7	0.0	1010.6	1066.8	1048.8	1041.8	1043.6	1067.4	1114.2	1083.7	1121.7	11038.9
EAF (%)	90.3	41.9	0.1	93.5	97.1	99.6	95.8	96.3	99.5	99.7	100.0	99.9	84.6
UCF (%)	99.9	51.3	0.1	93.5	97.1	99.6	95.8	96.3	99.5	99.8	100.0	99.9	86.1
LF (%)	90.3	41.4	0.0	93.6	95.6	97.1	93.4	93.5	98.8	99.7	100.3	100.5	83.8
OF (%)	100.0	51.7	0.0	98.3	98.0	100.0	96.8	98.0	100.0	100.0	100.0	100.0	87.0
EUF (%)	9.7	58.1	99.9	6.5	2.9	0.4	4.2	3.7	0.5	0.3	0.0	0.1	15.4
PUF (%)	0.0	48.6	96.6	4.6	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	12.4
UCLF (%)	0.0	0.1	3.2	1.9	2.9	0.4	4.2	3.7	0.5	0.2	0.0	0.1	1.4
XUF (%)	9.7	9.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 31 Dec 1985      Lifetime Generation: 99561.5 GW(e).h  
 Date of First Criticality: 10 Mar 1997      Cumulative Energy Availability Factor: 81.9%  
 Date of Grid Connection: 10 Apr 1997      Cumulative Load Factor: 78.9%  
 Date of Commercial Operation: 29 Sep 2000      Cumulative Unit Capability Factor: 84.8%  
    Cumulative Energy Unavailability Factor: 18.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2000	3353.3	1455.0	77.6	77.6	77.6	77.6	78.7	78.7	2473	84.5
2001	10159.5	1455.0	83.4	82.0	80.4	79.7	79.7	79.5	7221	82.4
2002	9814.8	1455.0	83.0	82.4	81.5	80.5	77.0	78.4	7240	82.6
2003	10472.8	1500.0	87.6	84.0	83.3	81.3	79.7	78.8	7457	85.1
2004	10063.9	1500.0	88.0	85.0	80.1	81.0	76.4	78.2	7061	80.4
2005	10321.5	1500.0	84.1	84.8	81.6	81.2	78.6	78.3	7343	83.8
2006	9460.5	1500.0	81.6	84.3	79.6	80.9	72.0	77.3	6845	78.1
2007	11016.5	1500.0	86.8	84.6	85.2	81.5	83.8	78.2	7725	88.2
2008	11038.9	1500.0	86.1	84.8	84.6	81.9	83.8	78.9	7639	87.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1997 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		56			875	
B. Refuelling without a maintenance				57		
C. Inspection, maintenance or repair combined with refuelling	1055			434		
E. Testing of plant systems or component	3	4		123		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						74
L. Human factor related		36			23	
Z. Others					25	
Subtotal	1058	96	0	614	923	74
Total		1154			1611	

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

System	2008 Hours Lost	1997 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	15	
12. Reactor I&C Systems		95
13. Reactor Auxiliary System	15	55
15. Reactor Cooling System		10
31. Turbine and auxiliaries	26	590
32. Feedwater and Main Steam System		0
33. Circulating Water System		49
41. Main Generator System		10
42. Electrical Power Supply System		22
XX. Miscellaneous Systems		21
Total	56	852

# FR-72 CIVAUX-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9873.0 GW(e).h  
 Energy Availability Factor: 76.0%  
 Load Factor: 75.2%  
 Operating Factor: 79.3%  
 Energy Unavailability Factor: 24.0%  
 Total Off-line Time: 1818 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1116.3	1008.6	0.0	725.9	990.7	25.1	853.8	1046.4	998.7	1043.9	1012.9	1050.8	9873.0
EAF (%)	99.9	96.8	0.1	68.6	90.8	4.6	79.0	95.6	93.5	94.1	94.5	94.8	76.0
UCF (%)	99.9	100.0	0.1	68.7	97.5	4.6	79.7	96.2	94.1	94.3	94.5	94.8	77.0
LF (%)	100.4	96.9	0.0	67.4	89.1	2.3	76.8	94.1	92.8	93.7	94.1	94.5	75.2
OF (%)	100.0	100.0	0.3	73.9	92.2	5.0	80.6	100.0	99.7	100.0	100.0	100.0	79.3
EUF (%)	0.1	3.2	99.9	31.4	9.2	95.4	21.0	4.4	6.5	5.9	5.5	5.2	24.0
PUF (%)	0.1	0.0	89.5	4.4	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	8.0
UCLF (%)	0.0	0.0	10.4	26.9	2.5	95.4	20.0	3.8	5.9	5.7	5.5	5.2	15.0
XUF (%)	0.0	3.2	0.0	0.0	6.7	0.0	0.7	0.6	0.6	0.2	0.0	0.0	1.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 15 Oct 1988      Lifetime Generation: 85175.4 GW(e).h  
 Date of First Criticality: 29 Nov 1997      Cumulative Energy Availability Factor: 78.3%  
 Date of Grid Connection: 24 Dec 1997      Cumulative Load Factor: 77.3%  
 Date of Commercial Operation: 29 Jan 2002      Cumulative Unit Capability Factor: 79.6%  
    Cumulative Energy Unavailability Factor: 21.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2002	9544.1	1450.0	81.0	81.0	79.8	79.8	75.1	75.1	7331	83.7
2003	10932.1	1495.0	84.1	82.6	83.1	81.4	83.5	79.4	7438	84.9
2004	11276.5	1495.0	88.0	84.4	86.9	83.3	85.9	81.6	7816	89.0
2005	9672.3	1495.0	76.3	82.3	73.8	80.9	73.8	79.6	6855	78.2
2006	10318.2	1495.0	80.9	82.1	79.3	80.6	78.8	79.5	7189	82.1
2007	9031.5	1495.0	69.6	80.0	69.4	78.7	69.0	77.7	6242	71.2
2008	9873.0	1495.0	77.0	79.6	76.0	78.3	75.2	77.3	6967	79.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2002 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		842			311	
B. Refuelling without a maintenance	664			87		
C. Inspection, maintenance or repair combined with refuelling				669		
E. Testing of plant systems or component	1			29		
L. Human factor related					40	
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.			46			
Z. Others		269			97	
Subtotal	665	1111	46	785	448	6
Total		1822			1239	

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

System	2008 Hours Lost	2002 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		13
13. Reactor Auxiliary System		8
14. Safety Systems		3
15. Reactor Cooling System		45
16. Steam generation system	12	
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		9
35. All other I&C Systems	144	
41. Main Generator System	2	40
42. Electrical Power Supply System	684	179
XX. Miscellaneous Systems		2
Total	842	307

## FR-73 CIVAUX-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 11321.5 GW(e).h  
 Energy Availability Factor: 89.0%  
 Load Factor: 86.2%  
 Operating Factor: 92.0%  
 Energy Unavailability Factor: 11.0%  
 Total Off-line Time: 700 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1066.4	1011.6	1059.6	1018.7	885.9	11.0	1034.6	989.0	1030.6	1090.0	1025.3	1098.6	11321.5
EAF (%)	99.7	99.8	95.3	94.6	79.8	2.5	96.8	99.2	99.5	99.9	99.9	100.0	89.0
UCF (%)	99.7	99.8	95.3	100.0	96.9	2.5	98.1	99.5	99.6	99.9	99.9	100.0	91.1
LF (%)	95.9	97.2	95.3	94.6	79.6	1.0	93.0	88.9	95.7	97.9	95.3	98.8	86.2
OF (%)	100.0	100.0	99.9	100.0	97.2	5.8	100.0	100.0	100.0	100.0	100.0	100.0	92.0
EUF (%)	0.3	0.2	4.7	5.4	20.2	97.5	3.2	0.8	0.5	0.1	0.1	0.0	11.0
PUF (%)	0.0	0.0	0.1	0.0	3.1	92.0	1.4	0.0	0.1	0.0	0.0	0.0	7.9
UCLF (%)	0.3	0.2	4.7	0.0	0.0	5.5	0.5	0.4	0.4	0.1	0.1	0.0	1.0
XUF (%)	0.0	0.0	0.0	5.4	17.1	0.0	1.3	0.3	0.1	0.0	0.0	0.0	2.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Apr 1991      Lifetime Generation: 85407.5 GW(e).h  
 Date of First Criticality: 27 Nov 1999      Cumulative Energy Availability Factor: 83.2%  
 Date of Grid Connection: 24 Dec 1999      Cumulative Load Factor: 79.4%  
 Date of Commercial Operation: 23 Apr 2002      Cumulative Unit Capability Factor: 84.8%  
    Cumulative Energy Unavailability Factor: 16.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2002	7199.1	1450.0	94.6	94.6	92.0	92.0	75.2	75.2	5751	87.1
2003	9084.8	1495.0	70.5	80.7	70.4	79.5	69.4	71.8	6542	74.7
2004	11698.6	1495.0	90.0	84.1	89.6	83.2	89.1	78.2	8042	91.6
2005	9621.4	1495.0	75.9	81.9	73.5	80.6	73.5	76.9	6748	77.0
2006	11140.1	1495.0	91.6	84.0	89.8	82.5	85.1	78.6	7811	89.2
2007	9973.8	1495.0	82.3	83.7	80.2	82.1	76.1	78.2	7141	81.5
2008	11321.5	1495.0	91.1	84.8	89.0	83.2	86.2	79.4	8085	92.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2002 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					162	
B. Refuelling without a maintenance	660			89	3	
C. Inspection, maintenance or repair combined with refuelling				697		
E. Testing of plant systems or component	3			27		
H. Nuclear regulatory requirement		15				
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						20
L. Human factor related					23	
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
Z. Others		24			31	
Subtotal	663	39	0	813	219	21
Total		702			1053	

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

System	2008 Hours Lost	2002 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		49
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		42
15. Reactor Cooling Systems		35
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		9
33. Circulating Water System		2
42. Electrical Power Supply Systems		8
Total	0	158

# FR-42 CRUAS-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 6281.4 GW(e).h  
 Energy Availability Factor: 79.2%  
 Load Factor: 78.4%  
 Operating Factor: 83.2%  
 Energy Unavailability Factor: 20.8%  
 Total Off-line Time: 1475 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h		537.7		646.3	323.8	0.0	479.4	615.2	609.5	408.7	642.8	673.4	6281.4
EAF (%)		84.6		98.6	48.3	0.0	70.9	96.3	93.4	62.0	98.7	99.7	79.2
UCF (%)		85.1		99.7	49.4	0.0	71.8	98.0	98.1	67.9	98.9	99.8	80.7
LF (%)		87.4		98.2	47.6	0.0	70.4	90.4	92.5	60.0	97.6	98.9	78.4
OF (%)		90.0		100.1	51.6	0.0	85.2	100.0	100.0	70.7	100.0	100.0	83.2
EUf (%)		15.4		1.4	51.7	100.0	29.1	3.7	6.6	38.0	1.3	0.3	20.8
PUF (%)		0.1		0.2	48.5	46.7	12.4	0.2	0.1	0.1	0.2	0.1	9.1
UCLF (%)		14.7		0.1	2.0	53.3	15.8	1.9	1.8	32.1	0.8	0.1	10.1
XUF (%)		0.5		1.1	1.2	0.0	0.9	1.6	4.7	5.9	0.2	0.1	1.5

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Aug 1978      Lifetime Generation: 140640.6 GW(e).h  
 Date of First Criticality: 02 Apr 1983      Cumulative Energy Availability Factor: 79.3%  
 Date of Grid Connection: 29 Apr 1983      Cumulative Load Factor: 71.5%  
 Date of Commercial Operation: 02 Apr 1984      Cumulative Unit Capability Factor: 81.0%  
    Cumulative Energy Unavailability Factor: 20.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	4800.0	880.0	82.6	82.6	82.6	82.6	82.6	82.6	6130	92.9
1985	5185.2	880.0	77.2	79.5	72.0	76.5	67.3	73.9	6615	75.5
1986	5888.0	880.0	87.6	82.5	86.0	80.0	76.4	74.8	7377	84.2
1987	5359.5	880.0	83.7	82.8	81.8	80.5	69.5	73.4	6860	78.3
1988	4025.0	880.0	98.0	86.0	96.7	83.9	52.1	68.9	5562	63.3
1989	5648.9	880.0	86.1	86.0	83.6	83.9	73.3	69.7	7239	82.6
1990	4983.5	880.0	84.8	85.8	82.6	83.7	64.6	68.9	6809	77.7
1991	4477.8	880.0	68.2	83.6	65.3	81.3	58.1	67.5	5762	65.8
1992	5739.4	880.0	81.0	83.3	77.8	80.9	74.2	68.3	7183	81.8
1993	6156.6	880.0	87.2	83.7	84.6	81.3	79.9	69.5	7353	83.9
1994	6181.2	915.0	84.5	83.7	84.3	81.6	77.1	70.2	7498	85.6
1995	4630.4	915.0	63.3	81.9	62.5	79.9	57.8	69.1	5624	64.2
1996	6258.5	915.0	83.9	82.1	83.0	80.1	77.9	69.8	7478	85.1
1997	5271.2	915.0	77.9	81.8	74.1	79.7	65.8	69.5	6784	77.4
1998	6387.3	915.0	90.8	82.4	89.5	80.4	79.7	70.2	7864	89.8
1999	5890.7	915.0	85.5	82.6	83.8	80.6	73.5	70.4	7367	84.1
2000	6320.5	915.0	87.6	82.9	86.0	80.9	78.6	70.9	7742	88.1
2001	5918.3	915.0	81.7	82.8	81.1	80.9	73.8	71.1	7264	82.9
2002	6069.8	915.0	80.6	82.7	80.5	80.9	75.7	71.4	7349	83.9
2003	6120.5	915.0	82.5	82.7	81.1	80.9	76.4	71.6	7403	84.5
2004	5866.1	915.0	77.0	82.4	76.1	80.7	73.0	71.7	6907	78.6
2005	5345.4	915.0	71.1	81.9	70.6	80.2	66.7	71.5	6311	72.0
2006	6491.0	915.0	84.8	82.0	83.7	80.4	81.0	71.9	7716	88.1
2007	4468.5	915.0	58.4	81.0	55.9	79.3	55.7	71.2	5506	62.9
2008	6281.4	915.0	80.7	81.0	79.2	79.3	78.4	71.5	7285	83.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		181			407	
B. Refuelling without a maintenance	694			26	1	
C. Inspection, maintenance or repair combined with refuelling				910	19	
D. Inspection, maintenance or repair without refuelling				24		
E. Testing of plant systems or component	1			18		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						1
H. Nuclear regulatory requirement		139				
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					36	19
L. Human factor related		485			63	
Z. Others					9	
Subtotal	695	805	0	978	535	21
Total		1500			1534	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		20
12. Reactor I&C Systems	73	14
13. Reactor Auxiliary System:		8
14. Safety Systems		12
15. Reactor Cooling System:		20
16. Steam generation system:	80	26
31. Turbine and auxiliaries	18	30
32. Feedwater and Main Steam System	9	8
33. Circulating Water System		3
41. Main Generator System:		234
42. Electrical Power Supply System:		5
XX. Miscellaneous Systems	1	1
Total	181	381



## FR-43 CRUAS-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 5597.4 GW(e).h  
 Energy Availability Factor: 69.7%  
 Load Factor: 69.8%  
 Operating Factor: 75.7%  
 Energy Unavailability Factor: 30.3%  
 Total Off-line Time: 2127 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	658.4	619.0	602.1	598.8	599.7	579.2	602.8	268.8		0.0	421.1	647.6	5597.4
EAF (%)	96.7	97.1	88.9	90.9	88.1	87.9	88.6	40.0		0.0	64.5	95.1	69.7
UCF (%)	97.1	97.3	89.0	91.9	92.1	91.1	91.9	41.7		0.0	64.5	95.1	70.8
LF (%)	96.7	100.7	88.4	91.0	88.1	87.9	88.6	39.5		0.0	63.9	95.1	69.8
OF (%)	100.0	103.6	92.5	100.1	100.0	100.0	100.0	45.6		0.0	72.2	96.5	75.7
EUF (%)	3.3	2.9	11.1	9.1	11.9	12.1	11.4	60.0		100.0	35.5	4.9	30.3
PUF (%)	0.2	0.1	0.1	0.1	0.1	0.1	0.2	54.7		0.0	7.8	0.4	13.6
UCLF (%)	2.7	2.5	10.8	8.0	7.8	8.8	7.8	3.6		100.0	27.7	4.5	15.5
XUF (%)	0.4	0.3	0.2	1.0	4.0	3.2	3.4	1.7		0.0	0.0	0.0	1.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

BASE LOAD

### 5. Historical Summary

Date of Construction Start: 15 Nov 1978      Lifetime Generation: 139585.3 GW(e).h  
 Date of First Criticality: 01 Aug 1984      Cumulative Energy Availability Factor: 78.5%  
 Date of Grid Connection: 06 Sep 1984      Cumulative Load Factor: 72.9%  
 Date of Commercial Operation: 01 Apr 1985      Cumulative Unit Capability Factor: 80.8%  
    Cumulative Energy Unavailability Factor: 21.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	4844.4	880.0	98.3	98.3	96.0	96.0	83.4	83.4	6425	97.3
1986	4955.0	880.0	70.4	82.4	70.1	81.2	64.3	72.5	6258	71.4
1987	5559.9	900.0	79.8	81.4	79.1	80.4	70.5	71.8	6761	77.2
1988	5698.0	915.0	85.0	82.4	80.6	80.5	70.9	71.5	7176	81.7
1989	6298.5	915.0	86.2	83.2	83.3	81.1	78.6	73.0	7697	87.9
1990	6001.8	915.0	79.8	82.6	77.7	80.5	74.9	73.4	7114	81.2
1991	4099.9	915.0	55.3	78.5	53.7	76.5	51.2	70.0	4838	55.2
1992	5946.9	915.0	77.0	78.3	77.0	76.5	74.0	70.6	6910	78.7
1993	5441.0	915.0	78.1	78.3	73.5	76.2	67.9	70.2	6463	73.8
1994	5566.1	915.0	96.8	80.2	94.1	78.0	69.4	70.2	6765	77.2
1995	5366.8	915.0	76.3	79.8	72.4	77.5	67.0	69.9	6581	75.1
1996	6521.9	915.0	88.8	80.6	87.1	78.3	81.1	70.8	7870	89.6
1997	5176.1	915.0	80.9	80.6	76.5	78.2	64.6	70.3	6596	75.3
1998	6003.6	915.0	82.8	80.8	79.0	78.3	74.9	70.7	7396	84.4
1999	6393.8	915.0	88.1	81.3	85.3	78.7	79.8	71.3	7787	88.9
2000	6420.9	915.0	87.0	81.7	85.6	79.2	79.9	71.8	7755	88.3
2001	5914.4	915.0	79.7	81.5	76.5	79.0	73.8	72.0	7053	80.5
2002	6547.4	915.0	86.5	81.8	86.0	79.4	81.7	72.5	7776	88.8
2003	5727.9	915.0	75.8	81.5	75.6	79.2	71.5	72.5	6927	79.1
2004	6613.0	915.0	86.0	81.7	84.9	79.5	82.3	73.0	7661	87.2
2005	6504.1	915.0	85.8	81.9	83.0	79.7	81.1	73.3	7684	87.7
2006	6509.5	915.0	85.6	82.1	84.3	79.9	81.2	73.7	7736	88.3
2007	4617.9	915.0	61.6	81.2	58.0	78.9	57.6	73.0	5602	63.9
2008	5597.4	915.0	70.8	80.8	69.7	78.5	69.8	72.9	6633	75.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		273			286	
B. Refuelling without a maintenance				26	3	
C. Inspection, maintenance or repair combined with refuelling	1125			888	10	
E. Testing of plant systems or component	8			9	0	
H. Nuclear regulatory requirement		132			42	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						
L. Human factor related		628			35	
Z. Others					23	
Subtotal	1133	1033	0	923	399	0
Total		2166			1322	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	161	23
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		1
15. Reactor Cooling Systems		9
16. Steam generation system		17
31. Turbine and auxiliaries	56	92
32. Feedwater and Main Steam System	24	8
33. Circulating Water System		1
35. All other I&C Systems	28	1
41. Main Generator Systems		119
XX. Miscellaneous Systems	4	1
Total	273	277

# FR-44 CRUAS-3

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 4858.6 GW(e).h  
 Energy Availability Factor: 60.7%  
 Load Factor: 60.6%  
 Operating Factor: 65.6%  
 Energy Unavailability Factor: 39.3%  
 Total Off-line Time: 3010 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	630.6	560.0	634.9	605.9	617.4	160.4		0.0	0.0	322.0		671.5	4858.6
EAF (%)	92.6	87.7	93.4	92.0	90.7	28.1		0.0	0.0	48.5		98.5	60.7
UCF (%)	92.6	87.7	93.4	92.0	92.0	28.4		0.0	0.0	48.5		98.6	60.9
LF (%)	92.6	91.1	93.3	92.1	90.7	24.4		0.0	0.0	47.2		98.6	60.6
OF (%)	100.0	98.4	99.9	100.1	100.0	30.1		0.0	0.0	61.3		100.0	65.6
EUF (%)	7.4	12.3	6.6	8.0	9.3	71.9		100.0	100.0	51.5		1.5	39.3
PUF (%)	0.1	0.1	0.1	0.3	0.1	70.0		35.5	0.0	9.5		0.4	18.2
UCLF (%)	7.3	12.2	6.5	7.8	7.9	1.6		64.5	100.0	42.0		1.0	20.9
XUF (%)	0.0	0.0	0.0	0.0	1.3	0.3		0.0	0.0	0.0		0.1	0.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 15 Apr 1979      Lifetime Generation: 139337.3 GW(e).h  
 Date of First Criticality: 09 Apr 1984      Cumulative Energy Availability Factor: 79.5%  
 Date of Grid Connection: 14 May 1984      Cumulative Load Factor: 71.6%  
 Date of Commercial Operation: 10 Sep 1984      Cumulative Unit Capability Factor: 82.0%  
    Cumulative Energy Unavailability Factor: 20.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	2311.0	880.0	91.9	91.9	91.9	91.9	89.7	89.7	2716	92.7
1985	5247.4	880.0	74.6	78.9	72.5	77.4	68.1	73.5	6557	74.9
1986	5967.1	880.0	89.5	83.5	89.2	82.5	77.4	75.2	7456	85.1
1987	4721.4	880.0	75.7	81.1	75.1	80.3	61.2	71.0	6013	68.6
1988	4773.0	880.0	99.9	85.5	98.6	84.5	61.7	68.9	6679	76.0
1989	5577.9	880.0	74.2	83.4	72.8	82.3	72.4	69.5	6571	75.0
1990	6129.2	915.0	87.5	84.0	85.2	82.8	76.5	70.6	7499	85.6
1991	6003.2	915.0	85.2	84.2	84.7	83.1	74.9	71.2	7374	84.2
1992	5174.6	915.0	73.2	82.8	71.0	81.6	64.4	70.4	6323	72.0
1993	5715.3	915.0	85.7	83.1	73.9	80.7	71.3	70.5	7232	82.6
1994	5014.0	915.0	78.9	82.7	78.1	80.5	62.6	69.7	6428	73.4
1995	6032.7	915.0	89.6	83.3	84.3	80.8	75.3	70.2	7525	85.9
1996	5882.2	915.0	99.7	84.7	91.9	81.7	73.2	70.5	7724	87.9
1997	5347.8	915.0	86.1	84.8	80.2	81.6	66.7	70.2	6961	79.5
1998	6281.4	915.0	81.7	84.6	78.7	81.4	78.4	70.8	7758	88.6
1999	6316.7	915.0	89.8	84.9	87.8	81.8	78.8	71.3	7654	87.4
2000	5494.0	915.0	81.4	84.7	79.0	81.7	68.4	71.1	6914	78.7
2001	5867.9	915.0	82.1	84.5	79.6	81.5	73.2	71.2	7254	82.8
2002	6052.0	915.0	82.1	84.4	80.9	81.5	75.5	71.5	7307	83.4
2003	5779.4	915.0	79.2	84.1	76.8	81.3	72.1	71.5	7146	81.6
2004	5081.3	915.0	65.9	83.2	64.1	80.4	63.2	71.1	6074	69.1
2005	6941.6	915.0	88.3	83.5	87.8	80.7	86.6	71.8	7863	89.8
2006	6487.5	915.0	83.5	83.5	83.1	80.9	80.9	72.2	7520	85.8
2007	5435.8	915.0	71.4	83.0	68.1	80.3	67.8	72.0	6456	73.7
2008	4858.6	915.0	60.9	82.0	60.7	79.5	60.6	71.6	5750	65.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		386			152	
B. Refuelling without a maintenance				24	1	
C. Inspection, maintenance or repair combined with refuelling	1511			907	33	
D. Inspection, maintenance or repair without refuelling					5	
E. Testing of plant systems or component				8		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					20	20
L. Human factor related		1144			50	
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.						0
Z. Others					29	
Subtotal	1511	1530	0	939	290	22
Total		3041			1251	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		11
13. Reactor Auxiliary Systems		1
14. Safety Systems		8
15. Reactor Cooling Systems		53
16. Steam generation system:	344	12
31. Turbine and auxiliaries	39	33
32. Feedwater and Main Steam System		6
41. Main Generator Systems	3	2
42. Electrical Power Supply Systems		9
XX. Miscellaneous Systems		0
Total	386	135

# FR-45 CRUAS-4

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 6228.8 GW(e).h  
 Energy Availability Factor: 77.3%  
 Load Factor: 77.7%  
 Operating Factor: 80.0%  
 Energy Unavailability Factor: 22.7%  
 Total Off-line Time: 1749 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h			667.3		0.0	202.3		657.9	636.0	653.5	661.3	689.4	6228.8
EAF (%)			97.9		0.0	32.7		96.8	96.6	95.9	99.7	99.6	77.3
UCF (%)			99.1		0.0	32.7		99.3	99.8	99.9	99.9	99.6	78.5
LF (%)			98.0		0.0	30.7		96.6	96.5	95.9	100.4	101.3	77.7
OF (%)			99.9		0.0	43.3		100.0	100.0	100.0	100.0	100.0	80.0
EUF (%)			2.1		100.0	67.3		3.2	3.4	4.1	0.3	0.4	22.7
PUF (%)			0.9		51.6	10.1		0.2	0.2	0.1	0.1	0.4	12.7
UCLF (%)			0.0		48.4	57.2		0.5	0.0	0.0	0.1	0.0	8.9
XUF (%)			1.2		0.0	0.0		2.5	3.2	4.1	0.2	0.0	1.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

BASE LOAD

## 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 136630.1 GW(e).h  
 Date of First Criticality: 01 Oct 1984      Cumulative Energy Availability Factor: 78.1%  
 Date of Grid Connection: 27 Oct 1984      Cumulative Load Factor: 71.7%  
 Date of Commercial Operation: 11 Feb 1985      Cumulative Unit Capability Factor: 80.2%  
    Cumulative Energy Unavailability Factor: 21.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	5187.0	880.0	87.1	87.1	85.7	85.7	73.5	73.5	6759	84.3
1986	5452.6	880.0	80.3	83.6	76.7	81.0	70.7	72.1	6816	77.8
1987	5313.4	880.0	85.1	84.1	84.2	82.1	68.9	71.0	6888	78.6
1988	3247.0	880.0	76.0	82.0	74.2	80.1	42.0	63.6	4271	48.6
1989	4852.2	880.0	71.4	79.9	71.3	78.3	62.9	63.4	6025	68.8
1990	6215.3	880.0	86.4	81.0	86.0	79.6	80.6	66.3	7607	86.8
1991	6005.4	880.0	83.9	81.4	81.1	79.8	77.9	68.0	7259	82.9
1992	4953.6	880.0	66.0	79.5	65.0	77.9	64.1	67.5	5862	66.7
1993	5280.0	880.0	84.9	80.1	77.1	77.8	68.5	67.6	6653	75.9
1994	5552.1	915.0	86.8	80.8	83.8	78.5	69.3	67.8	6856	78.3
1995	6280.3	915.0	86.0	81.3	82.1	78.8	78.4	68.8	7375	84.2
1996	5886.5	915.0	80.7	81.2	79.4	78.9	73.2	69.2	7180	81.7
1997	5976.6	915.0	84.1	81.4	80.2	79.0	74.6	69.6	7334	83.7
1998	6629.2	915.0	88.7	82.0	85.5	79.5	82.7	70.6	7885	90.0
1999	5829.8	915.0	85.4	82.2	81.9	79.6	72.7	70.7	7159	81.7
2000	6630.7	915.0	89.7	82.7	88.4	80.2	82.5	71.5	7915	90.1
2001	5915.8	915.0	83.3	82.7	80.6	80.2	73.8	71.6	7172	81.9
2002	6399.6	915.0	83.4	82.8	82.9	80.4	79.8	72.1	7474	85.3
2003	6296.7	915.0	82.9	82.8	81.6	80.4	78.6	72.4	7371	84.1
2004	6377.4	915.0	83.4	82.8	80.6	80.4	79.3	72.8	7443	84.7
2005	6255.1	915.0	81.6	82.7	79.6	80.4	78.0	73.0	7360	84.0
2006	3752.7	915.0	47.6	81.1	47.6	78.9	46.8	71.8	4259	48.6
2007	4947.3	915.0	62.0	80.3	61.7	78.1	61.7	71.4	5839	66.7
2008	6228.8	915.0	78.5	80.2	77.3	78.1	77.7	71.7	7011	80.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		239			309	
B. Refuelling without a maintenance				62	2	
C. Inspection, maintenance or repair combined with refuelling	1005			777	55	
D. Inspection, maintenance or repair without refuelling				9		
E. Testing of plant systems or component	0			12		3
G. Major back-fitting, refurbishment or upgrading activities without refuelling				106		
H. Nuclear regulatory requirement					2	
J. Grid limitation, failure or grid unavailability					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					11	46
L. Human factor related		528				
Z. Others					9	
Subtotal	1005	767	0	966	389	49
Total		1772			1404	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		7
13. Reactor Auxiliary System		19
14. Safety Systems		2
15. Reactor Cooling System		22
16. Steam generation system	120	127
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries	1	27
32. Feedwater and Main Steam System		14
41. Main Generator System		34
42. Electrical Power Supply System	96	10
XX. Miscellaneous Systems	22	1
Total	239	266

## FR-22 DAMPIERRE-1

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6545.3 GW(e).h  
**Energy Availability Factor:** 89.7%  
**Load Factor:** 83.7%  
**Operating Factor:** 91.6%  
**Energy Unavailability Factor:** 10.3%  
**Total Off-line Time:** 734 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	644.5	606.2	629.1	201.8	428.4	492.5	554.7	561.1	604.7	636.0	539.5	646.8	6545.3
<b>EAF (%)</b>	98.1	98.3	95.2	32.0	68.1	97.7	98.9	99.0	98.6	99.0	90.6	99.9	89.7
<b>UCF (%)</b>	98.6	98.5	100.0	36.6	68.5	98.0	99.4	99.3	99.1	99.4	90.6	99.9	90.7
<b>LF (%)</b>	97.3	97.9	95.0	31.5	64.7	76.9	83.8	84.7	94.4	95.9	84.2	97.7	83.7
<b>OF (%)</b>	100.0	100.0	99.9	36.7	75.3	100.0	100.0	96.1	100.0	100.0	91.1	100.0	91.6
<b>EUF (%)</b>	1.9	1.7	4.8	68.0	31.9	2.3	1.1	1.0	1.4	1.0	9.4	0.1	10.3
<b>PUF (%)</b>	0.1	0.0	0.0	63.4	18.8	0.0	0.1	0.0	0.0	0.0	0.0	0.0	6.8
<b>UCLF (%)</b>	1.3	1.5	0.0	0.0	12.7	2.0	0.5	0.7	0.9	0.6	9.4	0.1	2.5
<b>XUF (%)</b>	0.4	0.2	4.8	4.5	0.4	0.3	0.5	0.3	0.4	0.4	0.0	0.0	1.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Feb 1975	<b>Lifetime Generation:</b>	158771.5 GW(e).h
<b>Date of First Criticality:</b>	15 Mar 1980	<b>Cumulative Energy Availability Factor:</b>	76.3%
<b>Date of Grid Connection:</b>	23 Mar 1980	<b>Cumulative Load Factor:</b>	71.4%
<b>Date of Commercial Operation:</b>	10 Sep 1980	<b>Cumulative Unit Capability Factor:</b>	77.3%
		<b>Cumulative Energy Unavailability Factor:</b>	23.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	1822.0	898.0	61.9	61.9	61.9	61.9	69.1	69.1	2141	73.1
1981	4322.1	900.0	55.9	57.4	55.9	57.4	54.8	58.4	5270	60.2
1982	5043.9	890.0	65.6	60.9	65.6	60.9	64.7	61.1	5994	68.4
1983	6263.0	890.0	85.9	68.3	85.9	68.3	80.3	66.8	7847	89.6
1984	5391.0	890.0	73.6	69.6	73.6	69.6	69.0	67.3	6777	77.2
1985	5738.5	890.0	80.9	71.7	80.6	71.6	73.6	68.5	7223	82.5
1986	5157.4	890.0	75.9	72.3	75.7	72.3	66.2	68.1	6673	76.2
1987	4780.2	890.0	67.9	71.7	65.9	71.4	61.3	67.2	6245	71.3
1988	3920.0	890.0	61.2	70.5	59.6	70.0	50.1	65.2	5239	59.6
1989	6467.6	890.0	98.6	73.5	97.9	73.0	83.0	67.1	8207	93.7
1990	2187.1	890.0	36.3	69.9	34.0	69.2	28.1	63.3	3110	35.5
1991	6390.9	890.0	82.2	71.0	81.8	70.3	82.0	64.9	7305	83.4
1992	6305.1	890.0	81.7	71.9	80.7	71.2	80.7	66.2	7293	83.0
1993	6702.8	890.0	86.6	73.0	86.4	72.3	86.0	67.7	7676	87.6
1994	5299.2	890.0	69.7	72.7	68.9	72.1	68.0	67.7	6185	70.6
1995	6194.0	890.0	84.4	73.5	82.9	72.8	79.4	68.5	7413	84.6
1996	5895.5	890.0	83.1	74.1	82.2	73.3	75.4	68.9	7378	84.0
1997	5172.1	890.0	72.3	74.0	71.9	73.3	66.3	68.8	6465	73.8
1998	6042.7	890.0	81.9	74.4	80.5	73.7	77.5	69.2	7294	83.3
1999	5492.4	890.0	76.8	74.5	75.3	73.7	70.4	69.3	6815	77.8
2000	6153.8	890.0	87.0	75.1	85.4	74.3	78.7	69.8	7676	87.4
2001	4125.1	890.0	56.8	74.3	56.7	73.5	52.9	69.0	5152	58.8
2002	6249.6	890.0	87.6	74.9	86.8	74.1	80.2	69.5	7586	86.6
2003	5733.3	890.0	78.3	75.0	76.8	74.2	73.5	69.6	6964	79.5
2004	6091.2	890.0	89.7	75.6	89.3	74.8	77.9	70.0	7840	89.3
2005	5838.8	890.0	85.2	76.0	82.8	75.1	74.9	70.2	7554	86.2
2006	6615.1	890.0	91.2	76.6	88.6	75.7	84.8	70.7	8077	92.2
2007	6050.0	890.0	82.6	76.8	80.7	75.8	77.6	71.0	7329	83.7
2008	6545.3	890.0	90.7	77.3	89.7	76.3	83.7	71.4	8051	91.6



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		73			281	
B. Refuelling without a maintenance	552			22	6	
C. Inspection, maintenance or repair combined with refuelling				1092	36	
D. Inspection, maintenance or repair without refuelling				64	0	
E. Testing of plant systems or component:	0			2	1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			30		153	40
L. Human factor related		89			25	
Z. Others					17	
Subtotal	552	162	30	1180	519	40
Total		744			1739	

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		39
13. Reactor Auxiliary System:	9	12
14. Safety Systems		8
15. Reactor Cooling System:		45
16. Steam generation system:		53
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System		21
33. Circulating Water System		0
35. All other I&C Systems	18	
41. Main Generator System:		57
42. Electrical Power Supply System:		8
XX. Miscellaneous Systems	46	0
Total	73	256

## FR-29 DAMPIERRE-2

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6014.9 GW(e).h  
**Energy Availability Factor:** 82.1%  
**Load Factor:** 76.9%  
**Operating Factor:** 84.9%  
**Energy Unavailability Factor:** 17.9%  
**Total Off-line Time:** 1322 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	562.6	128.3	95.2	596.2	560.6	556.9	579.0	476.3	603.5	597.2	624.0	634.9	6014.9
<b>EAF (%)</b>	85.0	21.3	15.2	99.5	97.9	99.4	97.3	81.3	98.5	91.6	99.8	96.8	82.1
<b>UCF (%)</b>	99.3	27.5	15.3	99.5	98.0	99.7	97.8	81.6	98.9	91.8	99.8	96.9	84.0
<b>LF (%)</b>	85.0	20.7	14.4	93.0	84.7	86.9	87.4	71.9	94.2	90.2	97.4	95.9	76.9
<b>OF (%)</b>	100.0	27.6	20.4	100.0	96.2	100.0	100.0	83.2	100.0	93.0	100.0	97.2	84.9
<b>EUF (%)</b>	15.0	78.7	84.8	0.5	2.1	0.6	2.7	18.7	1.5	8.4	0.2	3.2	17.9
<b>PUF (%)</b>	0.4	72.5	58.6	0.1	0.4	0.2	0.1	0.1	0.2	4.8	0.1	0.1	11.3
<b>UCLF (%)</b>	0.3	0.0	26.2	0.4	1.6	0.2	2.1	18.3	0.9	3.4	0.1	3.0	4.8
<b>XUF (%)</b>	14.4	6.2	0.0	0.0	0.1	0.3	0.5	0.3	0.4	0.3	0.0	0.0	1.9

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Apr 1975	<b>Lifetime Generation:</b>	150982.7 GW(e).h
<b>Date of First Criticality:</b>	05 Dec 1980	<b>Cumulative Energy Availability Factor:</b>	77.0%
<b>Date of Grid Connection:</b>	10 Dec 1980	<b>Cumulative Load Factor:</b>	69.2%
<b>Date of Commercial Operation:</b>	16 Feb 1981	<b>Cumulative Unit Capability Factor:</b>	78.8%
		<b>Cumulative Energy Unavailability Factor:</b>	23.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	5465.3	900.0	77.3	77.3	77.3	77.3	75.8	75.8	6670	83.2
1982	4110.8	890.0	53.0	64.7	53.0	64.7	52.7	63.8	4848	55.3
1983	5191.0	890.0	67.7	65.7	67.7	65.7	66.6	64.7	6139	70.1
1984	5781.0	890.0	76.1	68.4	76.1	68.4	73.9	67.1	6884	78.4
1985	6056.9	890.0	84.5	71.6	84.3	71.6	77.7	69.2	7400	84.5
1986	5658.5	890.0	82.2	73.4	82.0	73.3	72.6	69.8	6983	79.7
1987	4856.0	890.0	78.8	74.2	76.4	73.8	62.3	68.7	5715	65.2
1988	4583.0	890.0	95.1	76.8	92.4	76.1	58.6	67.4	6153	70.0
1989	5485.3	890.0	79.7	77.2	77.0	76.2	70.4	67.8	6927	79.1
1990	4869.5	890.0	69.9	76.4	67.8	75.4	62.5	67.2	6292	71.8
1991	4201.9	890.0	67.6	75.6	63.3	74.3	53.9	66.0	5407	61.7
1992	5049.8	890.0	75.9	75.6	74.7	74.3	64.6	65.9	6429	73.2
1993	5976.6	890.0	87.4	76.6	79.6	74.7	76.7	66.7	7625	87.0
1994	4445.0	890.0	84.8	77.1	84.8	75.4	57.0	66.0	5328	60.8
1995	5562.0	890.0	95.5	78.4	95.0	76.8	71.3	66.4	6952	79.4
1996	5761.0	890.0	84.2	78.7	81.5	77.0	73.7	66.8	7437	84.7
1997	4966.6	890.0	69.3	78.2	67.5	76.5	63.7	66.7	6204	70.8
1998	5855.9	890.0	80.3	78.3	78.3	76.6	75.1	67.1	7192	82.1
1999	5312.9	890.0	72.6	78.0	69.2	76.2	68.1	67.2	6688	76.3
2000	5866.1	890.0	77.6	78.0	76.0	76.2	75.0	67.6	7121	81.1
2001	5355.9	890.0	75.1	77.8	72.4	76.0	68.7	67.6	6593	75.3
2002	4307.5	890.0	56.3	76.9	56.0	75.1	55.3	67.1	5196	59.3
2003	6268.3	890.0	81.4	77.1	81.3	75.4	80.4	67.7	7631	87.1
2004	5983.9	890.0	95.7	77.8	93.7	76.1	76.5	68.0	7286	82.9
2005	5255.3	890.0	76.3	77.8	75.8	76.1	67.4	68.0	6719	76.7
2006	5880.5	890.0	85.5	78.1	83.2	76.4	75.4	68.3	7371	84.1
2007	6582.7	890.0	91.7	78.6	88.9	76.9	84.4	68.9	8201	93.6
2008	6014.9	890.0	84.0	78.8	82.1	77.0	76.9	69.2	7462	84.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		155			315	
B. Refuelling without a maintenance outage				28	4	
C. Inspection, maintenance or repair combined with refuelling	900			1045	16	
D. Inspection, maintenance or repair without refuelling				80		
E. Testing of plant systems or component	33			3	0	
H. Nuclear regulatory requirement					4	
J. Grid limitation, failure or grid unavailability					1	1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			27		93	22
L. Human factor related		195			9	
Z. Others		21			9	
Subtotal	933	371	27	1156	451	23
Total		1331			1630	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	126	
12. Reactor I&C Systems		12
13. Reactor Auxiliary System:	6	14
14. Safety Systems		24
15. Reactor Cooling System:		46
16. Steam generation system:		30
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		64
32. Feedwater and Main Steam System		13
35. All other I&C Systems	1	
41. Main Generator System:	1	39
42. Electrical Power Supply System:		28
XX. Miscellaneous Systems	21	0
Total	155	270

## FR-30 DAMPIERRE-3

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6725.6 GW(e).h  
**Energy Availability Factor:** 90.0%  
**Load Factor:** 86.0%  
**Operating Factor:** 92.2%  
**Energy Unavailability Factor:** 10.0%  
**Total Off-line Time:** 685 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	640.7	600.0	609.4	585.2	611.1	619.9	597.8	368.0	184.8	644.6	627.6	636.6	6725.6
<b>EAF (%)</b>	99.9	99.8	99.8	99.8	98.9	98.1	93.7	60.8	30.1	99.0	99.8	99.9	90.0
<b>UCF (%)</b>	99.9	99.8	99.8	99.8	99.3	99.1	100.0	70.9	30.1	99.3	99.8	99.9	91.5
<b>LF (%)</b>	96.8	96.9	92.0	91.3	92.3	96.7	90.3	55.6	28.8	97.2	97.9	96.1	86.0
<b>OF (%)</b>	100.0	100.0	99.9	100.0	100.0	100.0	100.0	71.0	38.3	100.0	100.0	96.8	92.2
<b>EUF (%)</b>	0.1	0.2	0.2	0.2	1.1	1.9	6.3	39.2	69.9	1.0	0.2	0.1	10.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.0	0.0	29.1	54.6	0.0	0.0	0.1	7.0
<b>UCLF (%)</b>	0.1	0.2	0.2	0.2	0.6	0.9	0.0	0.0	15.3	0.7	0.2	0.0	1.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.4	1.0	6.3	10.1	0.1	0.3	0.0	0.0	1.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1975  
**Date of First Criticality:** 25 Jan 1981  
**Date of Grid Connection:** 30 Jan 1981  
**Date of Commercial Operation:** 27 May 1981

**Lifetime Generation:** 158152.4 GW(e).h  
**Cumulative Energy Availability Factor:** 77.6%  
**Cumulative Load Factor:** 72.8%  
**Cumulative Unit Capability Factor:** 79.2%  
**Cumulative Energy Unavailability Factor:** 22.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	4043.7	900.0	78.0	78.0	78.0	78.0	76.4	76.4	4789	81.4
1982	3767.6	890.0	48.7	60.6	48.7	60.6	48.3	59.7	4632	52.9
1983	5517.0	890.0	72.7	65.1	72.7	65.1	70.8	63.8	6638	75.8
1984	6206.0	890.0	79.7	69.1	79.7	69.1	79.4	68.1	7121	81.1
1985	6364.4	890.0	85.1	72.5	84.9	72.4	81.6	71.0	7523	85.9
1986	6717.2	890.0	99.9	77.3	99.5	77.2	86.2	73.6	8330	95.1
1987	5019.5	890.0	82.4	78.1	79.3	77.5	64.4	72.2	6269	71.6
1988	4964.0	890.0	72.9	77.4	68.5	76.4	63.5	71.1	6435	73.3
1989	5912.9	890.0	82.2	77.9	78.4	76.6	75.8	71.7	7242	82.7
1990	5996.5	890.0	82.5	78.4	79.8	76.9	76.9	72.2	7348	83.9
1991	5124.1	890.0	70.0	77.6	69.6	76.2	65.7	71.6	6244	71.3
1992	4875.1	890.0	65.5	76.6	65.5	75.3	62.4	70.8	5814	66.2
1993	6148.8	890.0	82.8	77.1	82.8	75.9	78.9	71.4	7333	83.7
1994	5537.6	890.0	86.2	77.7	82.7	76.4	71.0	71.4	7013	80.1
1995	4773.5	890.0	83.4	78.1	80.2	76.7	61.2	70.7	6343	72.4
1996	5575.1	890.0	77.6	78.1	77.1	76.7	71.3	70.7	6940	79.0
1997	5720.9	890.0	81.0	78.3	78.3	76.8	73.4	70.9	7211	82.3
1998	5905.8	890.0	82.7	78.5	81.4	77.0	75.8	71.2	7210	82.3
1999	5779.4	890.0	80.9	78.7	78.2	77.1	74.1	71.3	7186	82.0
2000	4308.3	890.0	59.8	77.7	57.6	76.1	55.1	70.5	5378	61.2
2001	5993.0	890.0	77.8	77.7	77.4	76.2	76.9	70.8	7060	80.6
2002	5929.8	890.0	77.4	77.7	76.8	76.2	76.1	71.1	6877	78.5
2003	5346.9	890.0	69.0	77.3	68.9	75.9	68.6	71.0	6152	70.2
2004	6867.2	890.0	89.3	77.8	88.0	76.4	87.8	71.7	7920	90.2
2005	6242.4	890.0	86.5	78.2	84.1	76.7	80.1	72.0	7627	87.1
2006	6228.5	890.0	92.3	78.7	89.3	77.2	79.9	72.3	7991	91.2
2007	5614.1	890.0	78.7	78.7	76.0	77.2	72.0	72.3	6928	79.1
2008	6725.6	890.0	91.5	79.2	90.0	77.6	86.0	72.8	8100	92.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					288	
B. Refuelling without a maintenance				21	14	
C. Inspection, maintenance or repair combined with refuelling	552			1165	10	
D. Inspection, maintenance or repair without refuelling				30	1	
E. Testing of plant systems or component:				5	0	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			24		73	2
L. Human factor related		108			4	
Z. Others					7	
Subtotal	552	108	24	1221	397	2
Total		684			1620	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		4
13. Reactor Auxiliary System:		9
14. Safety Systems		41
15. Reactor Cooling System:		67
16. Steam generation system:		48
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		10
33. Circulating Water System		1
41. Main Generator System:		30
42. Electrical Power Supply System:		21
Total	0	261

## FR-31 DAMPIERRE-4

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 5249.1 GW(e).h  
**Energy Availability Factor:** 67.5%  
**Load Factor:** 67.1%  
**Operating Factor:** 71.9%  
**Energy Unavailability Factor:** 32.5%  
**Total Off-line Time:** 2468 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	631.0	596.7	573.7	357.7	0.0	0.0	0.0	544.5	570.0	661.5	645.5	668.5	5249.1
<b>EAF (%)</b>	99.2	98.7	86.9	56.5	0.0	0.0	0.0	82.2	89.2	99.4	99.9	99.5	67.5
<b>UCF (%)</b>	99.2	99.3	94.5	62.8	0.0	0.0	0.0	82.7	89.5	99.6	99.9	99.5	68.8
<b>LF (%)</b>	95.3	96.3	86.6	55.8	0.0	0.0	0.0	82.2	89.0	99.8	100.7	101.0	67.1
<b>OF (%)</b>	100.0	100.0	96.6	76.7	0.0	0.0	0.0	99.7	91.3	100.0	100.0	99.7	71.9
<b>EUF (%)</b>	0.8	1.3	13.1	43.5	100.0	100.0	100.0	17.8	10.8	0.6	0.1	0.5	32.5
<b>PUF (%)</b>	0.2	0.3	0.0	16.4	100.0	100.0	77.7	16.3	0.4	0.2	0.1	0.1	26.1
<b>UCLF (%)</b>	0.6	0.4	5.5	20.8	0.0	0.0	22.4	1.0	10.1	0.3	0.0	0.5	5.1
<b>XUF (%)</b>	0.0	0.6	7.6	6.4	0.0	0.0	0.0	0.5	0.3	0.2	0.0	0.0	1.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING



## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Dec 1975	<b>Lifetime Generation:</b>	149967.6 GW(e).h
<b>Date of First Criticality:</b>	05 Aug 1981	<b>Cumulative Energy Availability Factor:</b>	76.3%
<b>Date of Grid Connection:</b>	18 Aug 1981	<b>Cumulative Load Factor:</b>	70.6%
<b>Date of Commercial Operation:</b>	20 Nov 1981	<b>Cumulative Unit Capability Factor:</b>	78.1%
		<b>Cumulative Energy Unavailability Factor:</b>	23.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	1093.0	894.0	83.0	83.0	83.0	83.0	83.0	83.0	1300	88.8
1982	5745.6	890.0	81.8	82.0	81.8	82.0	73.7	75.0	7413	84.6
1983	4156.0	890.0	57.6	70.7	57.6	70.7	53.3	65.0	5207	59.4
1984	6276.0	890.0	85.1	75.3	85.1	75.3	80.3	69.8	7765	88.4
1985	5859.9	890.0	83.5	77.2	78.9	76.2	75.2	71.1	7387	84.3
1986	6664.9	890.0	88.8	79.5	88.5	78.5	85.5	73.9	7862	89.7
1987	5447.8	890.0	78.4	79.3	78.1	78.5	69.9	73.2	6795	77.6
1988	5086.0	890.0	82.9	79.8	79.9	78.7	65.1	72.1	6645	75.6
1989	5392.4	890.0	73.7	79.1	72.9	78.0	69.2	71.7	6621	75.6
1990	5153.0	890.0	91.2	80.4	87.3	79.0	66.1	71.1	6792	77.5
1991	6062.8	890.0	88.3	81.2	86.7	79.7	77.8	71.8	7612	86.9
1992	5331.5	890.0	76.7	80.8	74.5	79.3	68.2	71.5	6832	77.8
1993	4827.7	890.0	69.2	79.8	63.4	78.0	61.9	70.7	6103	69.7
1994	5264.0	890.0	80.7	79.9	79.5	78.1	67.5	70.4	7103	81.1
1995	5488.0	890.0	78.8	79.8	75.4	77.9	70.4	70.4	6997	79.9
1996	6118.5	890.0	83.7	80.1	82.9	78.2	78.3	70.9	7596	86.5
1997	5918.6	890.0	80.9	80.1	80.5	78.4	75.9	71.3	7178	81.9
1998	4506.5	890.0	60.6	79.0	59.0	77.2	57.8	70.5	5435	62.0
1999	4642.5	890.0	64.8	78.2	64.1	76.5	59.5	69.9	5770	65.9
2000	5598.7	890.0	76.0	78.1	75.2	76.4	71.6	70.0	6752	76.9
2001	5361.8	890.0	70.9	77.7	70.1	76.1	68.8	69.9	6422	73.3
2002	6134.5	890.0	85.3	78.1	83.8	76.5	78.7	70.3	7576	86.5
2003	5547.4	890.0	77.4	78.1	73.4	76.3	71.2	70.4	6759	77.2
2004	4531.8	890.0	61.3	77.3	59.4	75.6	58.0	69.8	5551	63.2
2005	6566.9	890.0	88.7	77.8	87.6	76.1	84.2	70.4	7956	90.8
2006	5905.4	890.0	85.8	78.1	83.6	76.4	75.7	70.6	7428	84.8
2007	5763.5	890.0	88.1	78.5	83.5	76.7	73.9	70.8	7384	84.3
2008	5249.1	890.0	68.8	78.1	67.5	76.3	67.1	70.6	6317	71.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		139			462	
B. Refuelling without a maintenance outage				24	1	
C. Inspection, maintenance or repair combined with refuelling	2160			992	30	
D. Inspection, maintenance or repair without refuelling				5		
E. Testing of plant systems or component	8			5	1	
H. Nuclear regulatory requirement					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					77	26
L. Human factor related		168			4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						7
Z. Others					14	
Subtotal	2168	307	0	1026	590	33
Total		2475			1649	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		54
12. Reactor I&C Systems		5
13. Reactor Auxiliary System:		56
14. Safety Systems	62	6
15. Reactor Cooling System:		9
16. Steam generation system:		111
31. Turbine and auxiliaries:	75	29
32. Feedwater and Main Steam System		30
33. Circulating Water System		1
41. Main Generator System:		94
42. Electrical Power Supply System:		4
XX. Miscellaneous Systems	2	
Total	139	399

# FR-11 FESSENHEIM-1

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 5147.4 GW(e).h  
**Energy Availability Factor:** 66.8%  
**Load Factor:** 66.8%  
**Operating Factor:** 69.9%  
**Energy Unavailability Factor:** 33.2%  
**Total Off-line Time:** 2640 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	623.1	606.0	648.2	618.3	594.2	590.0	624.6	158.1	0.0	0.0	37.8	646.9	5147.4
<b>EAF (%)</b>	95.2	98.9	99.1	97.6	90.9	93.2	95.9	24.8	0.0	0.0	7.8	98.8	66.8
<b>UCF (%)</b>	96.1	99.7	99.8	98.4	92.5	95.0	99.1	25.8	0.0	0.0	9.0	98.9	67.8
<b>LF (%)</b>	95.2	102.5	99.0	97.7	90.8	93.1	95.4	24.2	0.0	0.0	6.0	98.8	66.8
<b>OF (%)</b>	100.0	103.6	99.9	100.1	96.2	97.4	100.0	25.9	0.0	0.0	16.5	100.0	69.9
<b>EUF (%)</b>	4.8	1.1	0.9	2.4	9.1	6.8	4.1	75.2	100.0	100.0	92.2	1.2	33.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.1	68.1	0.0	35.8	1.0	14.9
<b>UCLF (%)</b>	3.9	0.3	0.2	1.6	7.5	5.0	0.9	0.1	31.9	100.0	55.3	0.0	17.3
<b>XUF (%)</b>	0.9	0.8	0.6	0.9	1.6	1.8	3.2	1.0	0.0	0.0	1.2	0.2	1.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

BASE LOAD

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Sep 1971	<b>Lifetime Generation:</b>	161828.8 GW(e).h
<b>Date of First Criticality:</b>	07 Mar 1977	<b>Cumulative Energy Availability Factor:</b>	70.7%
<b>Date of Grid Connection:</b>	06 Apr 1977	<b>Cumulative Load Factor:</b>	67.3%
<b>Date of Commercial Operation:</b>	01 Jan 1978	<b>Cumulative Unit Capability Factor:</b>	72.0%
		<b>Cumulative Energy Unavailability Factor:</b>	29.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	6079.2	890.0	78.2	78.2	78.2	78.2	78.0	78.0	7302	83.4
1979	4542.0	890.0	58.8	68.5	58.8	68.5	58.3	68.1	5338	60.9
1980	5510.0	890.0	70.7	69.2	70.7	69.2	70.5	68.9	6350	72.3
1981	5065.3	890.0	65.3	68.2	65.3	68.2	65.0	67.9	5844	66.7
1982	1848.2	880.0	24.0	59.5	24.0	59.5	24.0	59.2	2138	24.4
1983	5690.0	880.0	75.3	62.1	75.3	62.1	73.8	61.6	6701	76.5
1984	6503.0	880.0	85.2	65.4	85.2	65.4	84.1	64.8	7731	88.0
1985	6044.6	880.0	80.4	67.2	79.8	67.2	78.4	66.5	7105	81.1
1986	5661.3	880.0	75.1	68.1	74.7	68.0	73.4	67.3	6702	76.5
1987	5029.6	880.0	74.1	68.7	73.6	68.6	65.2	67.1	6147	70.2
1988	5399.0	880.0	86.5	70.3	77.9	69.4	69.8	67.3	7069	80.5
1989	3253.3	880.0	46.1	68.3	43.4	67.3	42.2	65.2	4108	46.9
1990	5036.7	880.0	79.6	69.2	74.6	67.8	65.3	65.3	6481	74.0
1991	4053.5	880.0	55.7	68.2	55.5	66.9	52.6	64.4	4900	55.9
1992	4867.1	880.0	67.2	68.2	66.9	66.9	63.0	64.3	6079	69.2
1993	5548.7	880.0	81.0	68.9	74.6	67.4	72.0	64.7	7161	81.7
1994	6186.1	880.0	87.4	70.0	86.5	68.5	80.2	65.6	7508	85.7
1995	5856.1	880.0	85.5	70.9	84.7	69.4	76.0	66.2	6990	79.8
1996	6165.0	880.0	85.3	71.6	85.2	70.3	79.8	66.9	7544	85.9
1997	5826.8	880.0	81.6	72.1	81.5	70.8	75.6	67.4	7209	82.3
1998	4617.1	880.0	64.3	71.8	61.7	70.4	59.9	67.0	5727	65.4
1999	5228.8	880.0	71.2	71.7	70.8	70.4	67.8	67.0	6283	71.7
2000	5782.6	880.0	81.1	72.1	80.8	70.9	74.8	67.4	7145	81.3
2001	5507.5	880.0	79.6	72.5	78.4	71.2	71.4	67.6	7095	81.0
2002	2989.7	880.0	42.9	71.3	41.1	70.0	38.8	66.4	3832	43.7
2003	6985.2	880.0	98.2	72.3	96.5	71.0	90.6	67.3	8518	97.2
2004	3726.5	880.0	50.2	71.5	49.6	70.2	48.2	66.6	4500	51.2
2005	5448.4	880.0	75.4	71.6	75.3	70.4	70.7	66.8	6673	76.2
2006	6875.7	880.0	94.1	72.4	93.5	71.2	89.2	67.5	8338	95.2
2007	4667.0	880.0	63.2	72.1	61.1	70.8	60.5	67.3	5715	65.2
2008	5147.4	880.0	67.8	72.0	66.8	70.7	66.8	67.3	6120	69.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1418			716	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	1042			1199	12	
D. Inspection, maintenance or repair without refuelling				52	10	
E. Testing of plant systems or component:	205			9	0	
H. Nuclear regulatory requirement					53	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					6	5
L. Human factor related					100	
Z. Others					2	
Subtotal	1247	1418	0	1260	902	5
Total		2665			2167	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	663	292
12. Reactor I&C Systems		30
13. Reactor Auxiliary Systems	144	5
14. Safety Systems	288	49
15. Reactor Cooling Systems	168	52
16. Steam generation system:		30
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	20	99
32. Feedwater and Main Steam System	117	27
33. Circulating Water System		0
35. All other I&C Systems		1
41. Main Generator Systems		84
42. Electrical Power Supply Systems	18	9
XX. Miscellaneous Systems		2
Total	1418	681

## FR-12 FESSENHEIM-2

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 5131.4 GW(e).h  
**Energy Availability Factor:** 66.7%  
**Load Factor:** 66.6%  
**Operating Factor:** 72.9%  
**Energy Unavailability Factor:** 33.3%  
**Total Off-line Time:** 2376 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	480.7	347.4	0.0	128.2	624.9	518.3	49.2	563.0	586.0	628.8	579.0	626.1	5131.4
<b>EAF (%)</b>	73.9	56.3	0.1	21.2	95.8	82.2	8.5	86.3	92.6	95.9	91.5	95.6	66.7
<b>UCF (%)</b>	74.3	57.0	0.1	21.6	98.5	86.2	9.0	90.0	95.6	98.0	93.4	97.2	68.4
<b>LF (%)</b>	73.4	58.7	0.0	20.3	95.4	81.8	7.5	86.0	92.5	95.9	91.4	95.6	66.6
<b>OF (%)</b>	83.5	64.0	0.0	27.4	100.0	100.0	11.8	93.0	99.3	100.0	95.6	100.0	72.9
<b>EUF (%)</b>	26.1	43.7	99.9	78.8	4.2	17.8	91.5	13.7	7.4	4.1	8.5	4.4	33.3
<b>PUF (%)</b>	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6
<b>UCLF (%)</b>	18.9	43.0	99.9	78.4	1.5	13.7	91.0	10.0	4.4	2.0	6.6	2.6	31.0
<b>XUF (%)</b>	0.4	0.7	0.0	0.3	2.7	4.1	0.5	3.7	3.0	2.1	1.9	1.5	1.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Feb 1972	<b>Lifetime Generation:</b>	167733.6 GW(e).h
<b>Date of First Criticality:</b>	27 Jun 1977	<b>Cumulative Energy Availability Factor:</b>	74.5%
<b>Date of Grid Connection:</b>	07 Oct 1977	<b>Cumulative Load Factor:</b>	70.2%
<b>Date of Commercial Operation:</b>	01 Apr 1978	<b>Cumulative Unit Capability Factor:</b>	75.5%
		<b>Cumulative Energy Unavailability Factor:</b>	25.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	4785.8	890.0	82.7	82.7	81.8	81.8	81.5	81.5	5648	85.6
1979	4521.0	890.0	58.7	69.0	58.7	68.6	58.0	68.1	5684	64.9
1980	5601.0	890.0	72.2	70.2	72.2	69.9	71.6	69.4	6603	75.2
1981	6055.0	890.0	79.4	72.6	79.4	72.5	77.7	71.6	7117	81.2
1982	6047.9	880.0	93.1	76.9	93.1	76.8	78.5	73.0	8247	94.1
1983	4315.0	880.0	58.2	73.7	58.2	73.6	56.0	70.1	5206	59.4
1984	6459.0	880.0	88.4	75.9	88.4	75.8	83.6	72.1	7860	89.5
1985	5917.2	880.0	80.0	76.4	78.6	76.1	76.8	72.7	7248	82.7
1986	5522.5	880.0	73.4	76.1	73.2	75.8	71.6	72.5	6573	75.0
1987	6150.1	880.0	83.6	76.8	82.6	76.5	79.8	73.3	7335	83.7
1988	4830.0	880.0	72.4	76.4	69.8	75.9	62.5	72.3	6158	70.1
1989	5643.4	880.0	97.0	78.2	96.2	77.6	73.2	72.4	6944	79.3
1990	3552.4	880.0	52.0	76.1	49.6	75.4	46.1	70.3	4612	52.6
1991	5308.4	880.0	73.3	75.9	72.8	75.2	68.9	70.2	6537	74.6
1992	2202.0	880.0	29.9	72.8	29.9	72.1	28.5	67.4	2699	30.7
1993	5775.1	880.0	81.0	73.3	77.6	72.5	74.9	67.9	7167	81.8
1994	5294.9	880.0	98.5	74.8	98.2	74.0	68.7	67.9	6807	77.7
1995	5098.3	880.0	71.5	74.6	70.5	73.8	66.1	67.8	6305	72.0
1996	6192.1	880.0	84.9	75.2	84.4	74.4	80.1	68.5	7515	85.6
1997	5808.6	880.0	80.6	75.5	80.0	74.7	75.3	68.8	6982	79.7
1998	5597.0	880.0	75.9	75.5	73.7	74.6	72.6	69.0	6797	77.6
1999	6392.6	880.0	87.1	76.0	86.4	75.2	82.9	69.6	7708	88.0
2000	3730.4	880.0	51.4	74.9	51.1	74.1	48.3	68.7	4514	51.4
2001	6699.9	880.0	88.6	75.5	87.3	74.7	86.9	69.5	7876	89.9
2002	6562.6	880.0	87.1	76.0	85.6	75.1	85.1	70.1	7729	88.2
2003	4589.5	880.0	60.7	75.4	60.7	74.5	59.5	69.7	5434	62.0
2004	6913.7	880.0	94.5	76.1	93.6	75.3	89.4	70.4	8435	96.0
2005	6381.2	880.0	87.6	76.5	85.1	75.6	82.8	70.9	7813	89.2
2006	4803.1	880.0	64.7	76.1	64.7	75.2	62.3	70.6	5844	66.7
2007	4816.7	880.0	64.5	75.7	62.9	74.8	62.5	70.3	5781	66.0
2008	5131.4	880.0	68.4	75.5	66.7	74.5	66.6	70.2	6384	72.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2403			513	3
B. Refuelling without a maintenance				22	1	
C. Inspection, maintenance or repair combined with refuelling				1150	7	
D. Inspection, maintenance or repair without refuelling				54		
E. Testing of plant systems or component				16	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirement					18	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					6	28
L. Human factor related					13	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.			3			0
Z. Others					11	
Subtotal	0	2403	3	1243	570	31
Total		2406			1844	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		52
12. Reactor I&C Systems		20
13. Reactor Auxiliary Systems		25
14. Safety Systems		26
15. Reactor Cooling System		30
16. Steam generation system		113
21. Fuel Handling and Storage Facilities		4
31. Turbine and auxiliaries	157	57
32. Feedwater and Main Steam System	708	39
33. Circulating Water System		4
41. Main Generator System		64
42. Electrical Power Supply System		5
XX. Miscellaneous Systems	1538	2
Total	2403	441



# FR-46 FLAMANVILLE-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 4962.4 GW(e).h  
 Energy Availability Factor: 42.9%  
 Load Factor: 42.5%  
 Operating Factor: 45.7%  
 Energy Unavailability Factor: 57.1%  
 Total Off-line Time: 4766 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	941.4	638.1	0.0	0.0	0.0	0.0	0.0	9.9	533.5	921.6	942.9	975.0	4962.4
EAF (%)	96.5	69.4	0.1	0.0	0.0	0.0	0.0	2.7	56.8	93.7	98.5	98.5	42.9
UCF (%)	98.2	75.8	0.1	0.0	0.0	0.0	0.0	2.7	57.0	94.6	99.2	99.3	43.8
LF (%)	95.1	68.9	0.0	0.0	0.0	0.0	0.0	1.0	55.7	93.1	98.5	98.5	42.5
OF (%)	100.0	76.3	0.0	0.0	0.0	0.0	0.0	9.7	68.3	96.1	100.0	100.0	45.7
EUAF (%)	3.5	30.6	99.9	100.0	100.0	100.0	100.0	97.3	43.2	6.3	1.5	1.5	57.1
PUF (%)	0.0	24.2	99.9	100.0	93.5	0.0	0.5	5.1	5.4	0.0	0.0	0.0	27.4
UCLF (%)	1.8	0.0	0.0	0.0	6.5	100.0	99.5	92.3	37.7	5.4	0.8	0.7	28.8
XUF (%)	1.7	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	0.7	0.7	0.9

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Dec 1979      Lifetime Generation: 180419.8 GW(e).h  
 Date of First Criticality: 29 Sep 1985      Cumulative Energy Availability Factor: 73.6%  
 Date of Grid Connection: 04 Dec 1985      Cumulative Load Factor: 68.6%  
 Date of Commercial Operation: 01 Dec 1986      Cumulative Unit Capability Factor: 76.1%  
    Cumulative Energy Unavailability Factor: 26.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	965.9	1290.0	97.3	97.3	97.3	97.3	100.6	100.6	726	97.6
1987	7150.8	1290.0	63.2	65.9	62.2	64.9	63.3	66.2	5656	64.6
1988	7175.0	1330.0	67.4	66.6	66.0	65.5	61.4	63.9	5757	65.5
1989	8775.2	1330.0	81.0	71.3	80.6	70.4	75.3	67.6	7146	81.6
1990	7090.0	1330.0	67.0	70.3	65.7	69.2	60.9	65.9	6360	72.6
1991	5882.9	1330.0	68.4	69.9	59.4	67.3	50.5	62.9	5481	62.6
1992	7606.8	1330.0	66.2	69.3	66.2	67.1	65.1	63.3	5901	67.2
1993	9301.8	1330.0	96.8	73.2	87.2	70.0	79.8	65.6	7936	90.6
1994	7145.8	1330.0	80.1	74.0	75.3	70.6	61.3	65.1	6515	74.4
1995	7665.1	1330.0	77.4	74.4	73.2	70.9	65.8	65.2	6654	76.0
1996	8598.3	1330.0	84.6	75.4	77.8	71.6	73.6	66.0	7050	80.3
1997	6853.9	1330.0	63.9	74.4	62.3	70.8	58.8	65.3	5529	63.1
1998	9469.4	1330.0	86.7	75.4	86.7	72.1	81.3	66.7	7855	89.7
1999	6979.4	1330.0	66.1	74.7	64.4	71.5	59.9	66.2	5906	67.4
2000	8035.3	1330.0	75.6	74.8	74.5	71.7	68.8	66.3	6607	75.2
2001	10038.5	1330.0	92.6	75.9	92.5	73.1	86.2	67.7	8126	92.8
2002	8141.8	1330.0	75.5	75.9	73.1	73.1	69.9	67.8	6736	76.9
2003	7510.8	1330.0	68.2	75.5	67.8	72.8	64.5	67.6	6090	69.5
2004	10630.0	1330.0	98.2	76.7	96.8	74.1	91.0	68.9	8668	98.7
2005	9099.9	1330.0	85.6	77.2	83.3	74.6	78.1	69.4	7627	87.1
2006	7790.9	1330.0	72.5	77.0	69.1	74.3	66.9	69.3	6675	76.2
2007	9595.6	1330.0	90.5	77.6	89.0	75.0	82.4	69.9	8041	91.8
2008	4962.4	1330.0	43.8	76.1	42.9	73.6	42.5	68.6	4018	45.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2317			733	
B. Refuelling without a maintenance				37	1	
C. Inspection, maintenance or repair combined with refuelling	2324			858		
D. Inspection, maintenance or repair without refuelling				33		
E. Testing of plant systems or component:	4			12	1	
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					21	32
L. Human factor related		96			9	
Z. Others		24			4	
Subtotal	2328	2437	0	940	769	34
Total	4765			1743		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	30	130
12. Reactor I&C Systems		37
13. Reactor Auxiliary Systems	480	23
14. Safety Systems	48	12
15. Reactor Cooling Systems	48	24
16. Steam generation system:		5
21. Fuel Handling and Storage Facilities	24	
31. Turbine and auxiliaries		156
32. Feedwater and Main Steam System	70	68
33. Circulating Water System		3
35. All other I&C Systems		1
41. Main Generator Systems	294	137
42. Electrical Power Supply Systems	1011	42
XX. Miscellaneous Systems	312	30
Total	2317	668

## FR-47 FLAMANVILLE-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 6140.9 GW(e).h  
 Energy Availability Factor: 54.4%  
 Load Factor: 52.6%  
 Operating Factor: 57.5%  
 Energy Unavailability Factor: 45.6%  
 Total Off-line Time: 3732 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	916.6	888.0	929.7	699.6	920.4	913.9	675.7	0.0	0.0	0.0	0.0	197.1	6140.9
EAF (%)	96.7	99.8	99.8	76.7	95.2	95.4	68.7	0.0	0.0	-0.1	0.0	21.9	54.4
UCF (%)	97.1	100.0	100.0	76.8	95.4	100.0	80.9	0.0	0.0	-0.1	0.0	45.3	57.9
LF (%)	92.6	95.9	94.0	73.1	93.0	95.4	68.3	0.0	0.0	0.0	0.0	19.9	52.6
OF (%)	99.2	100.0	99.9	77.4	97.0	100.0	80.9	0.0	0.0	0.0	0.0	36.8	57.5
EUF (%)	3.3	0.2	0.2	23.3	4.8	4.6	31.3	100.0	100.0	100.1	100.0	78.1	45.6
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	19.1	100.0	100.0	100.1	0.0	10.3	27.6
UCLF (%)	2.8	0.0	0.0	23.2	4.6	0.0	0.0	0.0	0.0	0.0	100.0	44.4	14.5
XUF (%)	0.4	0.2	0.2	0.1	0.2	4.5	12.2	0.0	0.0	0.0	0.0	23.4	3.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 May 1980      Lifetime Generation: 180080.4 GW(e).h  
 Date of First Criticality: 12 Jun 1986      Cumulative Energy Availability Factor: 76.2%  
 Date of Grid Connection: 18 Jul 1986      Cumulative Load Factor: 69.6%  
 Date of Commercial Operation: 09 Mar 1987      Cumulative Unit Capability Factor: 77.4%  
    Cumulative Energy Unavailability Factor: 23.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	5578.8	1290.0	88.9	88.9	88.7	88.7	58.9	58.9	5094	69.4
1988	7106.0	1330.0	67.4	77.1	65.4	75.8	60.8	60.0	5674	64.6
1989	4824.5	1330.0	50.6	67.7	48.7	66.2	41.4	53.4	3836	43.8
1990	7819.6	1330.0	76.6	70.0	75.7	68.7	67.1	57.0	6392	73.0
1991	7965.7	1330.0	72.3	70.5	70.6	69.1	68.4	59.3	6432	73.4
1992	8842.4	1330.0	78.2	71.8	78.0	70.6	75.7	62.2	6962	79.3
1993	7985.2	1330.0	71.4	71.8	69.1	70.4	68.5	63.1	6338	72.4
1994	8384.3	1330.0	75.4	72.2	75.3	71.0	72.0	64.2	6711	76.6
1995	8962.4	1330.0	82.1	73.3	81.4	72.2	76.9	65.7	7264	82.9
1996	9387.5	1330.0	87.5	74.8	86.6	73.7	80.4	67.2	7685	87.5
1997	8546.0	1330.0	95.4	76.7	95.3	75.7	73.4	67.7	7351	83.9
1998	5656.6	1330.0	55.4	74.9	55.4	74.0	48.6	66.1	4880	55.7
1999	7248.9	1330.0	67.4	74.3	65.2	73.3	62.2	65.8	6034	68.9
2000	9907.9	1330.0	94.2	75.8	93.7	74.8	84.8	67.2	8122	92.5
2001	8565.1	1330.0	77.9	75.9	76.2	74.9	73.5	67.6	6863	78.3
2002	8502.3	1330.0	78.1	76.0	77.9	75.1	73.0	68.0	6839	78.1
2003	10065.3	1330.0	93.6	77.1	93.4	76.1	86.4	69.1	8365	95.5
2004	7499.8	1330.0	68.3	76.6	66.8	75.6	64.2	68.8	6125	69.7
2005	9779.1	1330.0	89.1	77.3	86.7	76.2	83.9	69.6	7894	90.1
2006	10125.8	1330.0	98.0	78.3	97.5	77.3	86.9	70.5	8438	96.3
2007	8063.0	1330.0	78.3	78.3	76.5	77.2	69.2	70.4	7021	80.1
2008	6140.9	1330.0	57.9	77.4	54.4	76.2	52.6	69.6	5052	57.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1180			588	
B. Refuelling without a maintenance outage				31	3	
C. Inspection, maintenance or repair combined with refuelling	2351			844	32	
D. Inspection, maintenance or repair without refuelling				96		
E. Testing of plant systems or component	0			23	1	0
G. Major back-fitting, refurbishment or upgrading activities without refuelling				1		
H. Nuclear regulatory requirement		48			15	
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					19	2
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			155			
Z. Others					0	
Subtotal	2351	1228	155	995	659	5
Total		3734			1659	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	24	11
12. Reactor I&C Systems	144	21
13. Reactor Auxiliary System	45	51
14. Safety Systems		20
15. Reactor Cooling System	72	191
16. Steam generation system	699	37
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities	24	
31. Turbine and auxiliaries		85
32. Feedwater and Main Steam System		36
41. Main Generator System		54
42. Electrical Power Supply System	142	53
XX. Miscellaneous Systems	30	5
Total	1180	564

# FR-61 GOLFECH-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 8556.9 GW(e).h  
 Energy Availability Factor: 77.7%  
 Load Factor: 74.6%  
 Operating Factor: 81.1%  
 Energy Unavailability Factor: 22.3%  
 Total Off-line Time: 1656 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h					0.0	436.6	849.8					944.8	8556.9
EAF (%)					0.0	48.4	95.5					99.4	77.7
UCF (%)					0.0	49.9	96.7					99.7	80.0
LF (%)					0.0	46.3	87.2					96.9	74.6
OF (%)					0.0	59.6	97.2					99.9	81.1
EUF (%)					100.0	51.6	4.5					0.6	22.3
PUF (%)					74.3	9.5	0.0					0.0	14.2
UCLF (%)					25.7	40.7	3.3					0.3	5.8
XUF (%)					0.0	1.5	1.2					0.3	2.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 17 Nov 1982      Lifetime Generation: 157438.2 GW(e).h  
 Date of First Criticality: 24 Apr 1990      Cumulative Energy Availability Factor: 82.4%  
 Date of Grid Connection: 07 Jun 1990      Cumulative Load Factor: 75.4%  
 Date of Commercial Operation: 01 Feb 1991      Cumulative Unit Capability Factor: 85.3%  
    Cumulative Energy Unavailability Factor: 17.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1991	8871.6	1310.0	97.8	97.8	96.1	96.1	84.5	84.5	7608	94.9
1992	7065.9	1310.0	67.9	82.1	64.3	79.5	61.4	72.4	6128	69.8
1993	7925.6	1310.0	82.6	82.3	72.7	77.1	69.1	71.3	7143	81.5
1994	7756.1	1310.0	81.3	82.0	77.8	77.3	67.6	70.3	7215	82.4
1995	7897.8	1310.0	83.5	82.3	75.6	77.0	68.8	70.0	7005	80.0
1996	8862.4	1310.0	84.8	82.8	83.2	78.0	77.0	71.2	7598	86.5
1997	9151.6	1310.0	94.6	84.5	94.5	80.4	79.7	72.4	8000	91.3
1998	8576.6	1310.0	84.7	84.5	81.1	80.5	74.7	72.7	7472	85.3
1999	7926.3	1310.0	80.8	84.1	77.2	80.1	69.1	72.3	6837	78.0
2000	8766.3	1310.0	94.1	85.1	93.9	81.5	76.2	72.7	7901	89.9
2001	7511.9	1310.0	69.1	83.6	68.4	80.3	65.5	72.0	6147	70.2
2002	9242.4	1310.0	82.5	83.5	81.4	80.4	80.5	72.8	7301	83.3
2003	10342.7	1310.0	99.2	84.8	93.9	81.5	90.1	74.1	8252	94.2
2004	9051.1	1310.0	87.6	85.0	84.7	81.7	78.7	74.4	7721	87.9
2005	8653.5	1310.0	78.7	84.5	78.7	81.5	75.4	74.5	7014	80.1
2006	9475.1	1310.0	88.7	84.8	85.7	81.8	82.6	75.0	7848	89.6
2007	9517.6	1310.0	98.2	85.6	97.7	82.7	82.9	75.5	8554	97.6
2008	8556.9	1310.0	80.0	85.3	77.7	82.4	74.6	75.4	7104	81.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1990 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		32			180	
B. Refuelling without a maintenance				35	2	
C. Inspection, maintenance or repair combined with refuelling	1176			795	2	
D. Inspection, maintenance or repair without refuelling				59		
E. Testing of plant systems or component				63		
H. Nuclear regulatory requirement		5			2	
J. Grid limitation, failure or grid unavailability			1			
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					9	1
L. Human factor related		469			9	1
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						21
Z. Others					4	
Subtotal	1176	506	1	952	208	23
Total		1683			1183	

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

System	2008 Hours Lost	1990 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems	15	5
13. Reactor Auxiliary System:		7
14. Safety Systems		11
15. Reactor Cooling System:		28
16. Steam generation system:		6
21. Fuel Handling and Storage Facilities		19
31. Turbine and auxiliaries	17	8
32. Feedwater and Main Steam System		8
33. Circulating Water System		6
35. All other I&C Systems		2
41. Main Generator System:		44
42. Electrical Power Supply System:		2
Total	32	152

## FR-68 GOLFECH-2

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 8484.2 GW(e).h  
**Energy Availability Factor:** 76.6%  
**Load Factor:** 73.9%  
**Operating Factor:** 81.0%  
**Energy Unavailability Factor:** 23.4%  
**Total Off-line Time:** 1665 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	912.2			882.1		886.1	844.2	817.9			286.0	849.6	8484.2
<b>EAF (%)</b>	96.6			97.7		95.5	86.6	83.9			31.6	97.9	76.6
<b>UCF (%)</b>	97.2			98.4		98.1	90.8	95.4			31.8	98.4	79.1
<b>LF (%)</b>	93.6			93.6		93.9	86.6	83.9			30.3	87.2	73.9
<b>OF (%)</b>	97.8			98.9		100.0	100.0	100.0			37.1	95.2	81.0
<b>EUF (%)</b>	3.4			2.3		4.5	13.4	16.1			68.4	2.1	23.4
<b>PUF (%)</b>	0.1			0.0		0.0	0.0	0.0			12.1	0.0	14.5
<b>UCLF (%)</b>	2.7			1.7		1.9	9.2	4.7			56.1	1.7	6.5
<b>XUF (%)</b>	0.6			0.7		2.6	4.2	11.4			0.1	0.5	2.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1984  
**Date of First Criticality:** 21 May 1993  
**Date of Grid Connection:** 18 Jun 1993  
**Date of Commercial Operation:** 04 Mar 1994

**Lifetime Generation:** 131163.9 GW(e).h  
**Cumulative Energy Availability Factor:** 83.5%  
**Cumulative Load Factor:** 75.3%  
**Cumulative Unit Capability Factor:** 85.3%  
**Cumulative Energy Unavailability Factor:** 16.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1994	6507.6	1310.0	99.7	99.7	99.4	99.4	67.6	67.6	5912	80.5
1995	7030.1	1310.0	66.7	81.7	62.9	79.6	61.3	64.2	6002	68.5
1996	9016.4	1310.0	84.7	82.8	83.6	81.0	78.4	69.2	7549	85.9
1997	8649.9	1310.0	83.7	83.0	80.2	80.8	75.4	70.8	7414	84.6
1998	8359.6	1310.0	85.1	83.4	82.9	81.2	72.8	71.2	7222	82.4
1999	9516.9	1310.0	98.0	85.9	97.7	84.0	82.9	73.2	8407	96.0
2000	8877.6	1310.0	84.5	85.7	81.8	83.7	77.1	73.8	7535	85.8
2001	8958.3	1310.0	85.3	85.7	84.3	83.8	78.1	74.3	7586	86.6
2002	9847.1	1310.0	97.3	87.0	97.3	85.3	85.8	75.6	8553	97.6
2003	7614.9	1310.0	77.7	86.0	75.2	84.3	66.4	74.7	7115	81.2
2004	7093.7	1310.0	65.7	84.2	65.7	82.6	61.6	73.5	6129	69.8
2005	9936.3	1310.0	99.2	85.4	98.9	84.0	86.6	74.6	8715	99.5
2006	8516.6	1310.0	84.8	85.4	78.2	83.5	74.2	74.6	7150	81.6
2007	9922.0	1310.0	90.9	85.8	90.2	84.0	86.5	75.4	8026	91.6
2008	8484.2	1310.0	79.1	85.3	76.6	83.5	73.9	75.3	7095	81.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1993 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		162			266	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1225			758	2	
E. Testing of plant systems or component				51		
H. Nuclear regulatory requirement		17			1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			28		47	
L. Human factor related		262			2	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						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.)						0
S. Fuel management limitation (including high flux tilt, stretch out of coast-down operation)					5	
Subtotal	1225	441	28	809	323	13
Total		1694			1145	

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

System	2008 Hours Lost	1993 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems	26	39
13. Reactor Auxiliary Systems	43	4
14. Safety Systems	80	
15. Reactor Cooling System	8	11
16. Steam generation system		3
31. Turbine and auxiliaries	5	11
32. Feedwater and Main Steam System		1
33. Circulating Water System		3
41. Main Generator System		157
42. Electrical Power Supply System		13
XX. Miscellaneous Systems		0
Total	162	243



# FR-20 GRAVELINES-1

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6716.7 GW(e).h  
**Energy Availability Factor:** 89.1%  
**Load Factor:** 84.0%  
**Operating Factor:** 92.7%  
**Energy Unavailability Factor:** 10.9%  
**Total Off-line Time:** 639 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	627.2	580.7	628.2	623.3	633.0	607.8	616.2	247.7	377.3	600.3	567.2	608.0	6716.7
<b>EAF (%)</b>	99.0	98.9	96.4	98.0	98.0	96.2	91.3	37.0	59.6	97.6	98.9	99.0	89.1
<b>UCF (%)</b>	99.9	99.7	99.7	99.6	99.2	99.5	100.0	45.3	60.3	98.9	99.7	99.8	91.8
<b>LF (%)</b>	92.6	91.7	92.8	95.1	93.5	92.8	91.0	36.6	57.6	88.5	86.6	89.8	84.0
<b>OF (%)</b>	100.0	100.0	99.9	100.0	100.0	100.0	100.0	45.4	67.8	100.0	100.0	100.0	92.7
<b>EUF (%)</b>	1.0	1.1	3.6	2.0	2.0	3.8	8.7	63.0	40.4	2.4	1.1	1.0	10.9
<b>PUF (%)</b>	0.1	0.0	0.0	0.1	0.0	0.1	0.0	54.7	27.5	0.0	0.0	0.1	6.9
<b>UCLF (%)</b>	0.0	0.3	0.3	0.3	0.8	0.4	0.0	0.0	12.2	1.1	0.4	0.1	1.3
<b>XUF (%)</b>	0.8	0.9	3.3	1.6	1.2	3.3	8.7	8.3	0.7	1.3	0.7	0.8	2.7

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Feb 1975	<b>Lifetime Generation:</b>	159648.9 GW(e).h
<b>Date of First Criticality:</b>	21 Feb 1980	<b>Cumulative Energy Availability Factor:</b>	76.4%
<b>Date of Grid Connection:</b>	13 Mar 1980	<b>Cumulative Load Factor:</b>	70.6%
<b>Date of Commercial Operation:</b>	25 Nov 1980	<b>Cumulative Unit Capability Factor:</b>	78.1%
		<b>Cumulative Energy Unavailability Factor:</b>	23.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	920.0	918.0	68.4	68.4	68.4	68.4	68.3	68.3	1037	70.8
1981	5001.8	920.0	63.2	64.0	63.2	64.0	62.1	63.0	5785	66.0
1982	2987.5	910.0	38.2	52.2	38.2	52.2	37.5	51.3	3602	41.1
1983	5537.0	910.0	69.9	57.8	69.9	57.8	69.5	57.0	6237	71.2
1984	6617.0	910.0	86.2	64.6	86.2	64.6	82.8	63.2	7654	87.1
1985	6211.7	910.0	81.3	67.8	80.3	67.6	77.9	66.0	7218	82.4
1986	5725.5	910.0	74.8	68.9	73.4	68.6	71.8	67.0	6508	74.3
1987	4650.1	910.0	89.3	71.8	89.0	71.4	58.3	65.8	5895	67.3
1988	4289.0	910.0	57.6	70.0	57.0	69.6	53.7	64.3	5306	60.4
1989	5109.6	910.0	67.7	69.8	67.7	69.4	64.1	64.3	6224	71.1
1990	4463.6	910.0	61.3	68.9	59.2	68.4	56.0	63.4	5425	61.9
1991	5675.0	910.0	74.0	69.4	73.4	68.9	71.2	64.1	6619	75.6
1992	5834.7	910.0	84.0	70.6	80.7	69.8	73.0	64.9	7250	82.5
1993	5866.9	910.0	93.8	72.4	80.5	70.6	73.6	65.5	7794	89.0
1994	4657.7	910.0	68.6	72.1	67.7	70.4	58.4	65.0	5729	65.4
1995	6123.1	910.0	83.8	72.9	82.8	71.2	76.8	65.8	7461	85.2
1996	6089.2	910.0	83.5	73.5	80.3	71.8	76.2	66.4	7357	83.8
1997	5860.4	910.0	82.9	74.1	81.7	72.4	73.5	66.9	7236	82.6
1998	6321.4	910.0	87.1	74.8	83.7	73.0	79.3	67.5	7622	87.0
1999	5841.3	910.0	80.3	75.1	78.6	73.3	73.3	67.8	7116	81.2
2000	6531.9	910.0	88.2	75.7	88.1	74.0	81.7	68.5	7705	87.7
2001	5289.4	910.0	67.6	75.3	66.7	73.7	66.4	68.4	6034	68.9
2002	5769.3	915.0	88.7	75.9	86.4	74.3	72.0	68.6	7057	80.6
2003	5919.5	910.0	85.7	76.4	85.1	74.7	74.3	68.8	7420	84.7
2004	6213.9	910.0	86.4	76.8	86.2	75.2	77.7	69.2	7664	87.2
2005	6188.7	910.0	84.6	77.1	82.5	75.5	77.6	69.5	7400	84.5
2006	6244.4	910.0	84.9	77.4	82.8	75.8	78.3	69.9	7567	86.4
2007	6168.2	910.0	82.4	77.6	80.1	75.9	77.4	70.1	7312	83.5
2008	6716.7	910.0	91.8	78.1	89.1	76.4	84.0	70.6	8146	92.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		29			478	
B. Refuelling without a maintenance	552			20	1	
C. Inspection, maintenance or repair combined with refuelling				1103	16	
D. Inspection, maintenance or repair without refuelling				11	4	
E. Testing of plant systems or component:				13	5	
H. Nuclear regulatory requirement					5	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					30	19
L. Human factor related		58			13	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Others					12	
Subtotal	552	87	0	1147	564	20
Total		639			1731	

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		152
12. Reactor I&C Systems		7
13. Reactor Auxiliary System:		17
14. Safety Systems		8
15. Reactor Cooling System:		103
16. Steam generation system:		96
31. Turbine and auxiliaries:		21
32. Feedwater and Main Steam System		20
33. Circulating Water System		1
41. Main Generator System:		13
42. Electrical Power Supply System:	12	32
XX. Miscellaneous Systems	17	
Total	29	470

## FR-21 GRAVELINES-2

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6124.1 GW(e).h  
**Energy Availability Factor:** 78.3%  
**Load Factor:** 76.6%  
**Operating Factor:** 82.8%  
**Energy Unavailability Factor:** 21.7%  
**Total Off-line Time:** 1514 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	665.4	620.0	625.0	70.6	0.0	501.7	596.1	556.0	614.6	624.9	609.3	640.5	6124.1
<b>EAF (%)</b>	98.9	98.7	92.5	11.3	0.0	77.2	91.8	82.4	95.9	96.6	97.4	97.4	78.3
<b>UCF (%)</b>	99.4	99.4	100.0	13.1	0.0	77.4	94.8	86.9	99.6	99.0	99.6	99.2	80.7
<b>LF (%)</b>	98.3	97.9	92.3	10.8	0.0	76.6	88.0	82.1	93.8	92.2	93.0	94.6	76.6
<b>OF (%)</b>	100.0	100.0	99.9	13.3	0.0	91.0	96.9	92.3	100.0	100.0	100.0	100.0	82.8
<b>EUF (%)</b>	1.1	1.3	7.5	88.7	100.0	22.8	8.2	17.6	4.1	3.4	2.6	2.6	21.7
<b>PUF (%)</b>	0.0	0.1	0.0	86.9	53.5	12.8	0.0	0.1	0.1	0.0	0.1	0.0	12.7
<b>UCLF (%)</b>	0.6	0.5	0.0	0.0	46.5	9.8	5.2	13.0	0.3	1.0	0.3	0.8	6.6
<b>XUF (%)</b>	0.5	0.7	7.5	1.9	0.0	0.2	3.0	4.5	3.7	2.4	2.3	1.8	2.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Mar 1975	<b>Lifetime Generation:</b>	165699.8 GW(e).h
<b>Date of First Criticality:</b>	02 Aug 1980	<b>Cumulative Energy Availability Factor:</b>	79.3%
<b>Date of Grid Connection:</b>	26 Aug 1980	<b>Cumulative Load Factor:</b>	73.6%
<b>Date of Commercial Operation:</b>	01 Dec 1980	<b>Cumulative Unit Capability Factor:</b>	80.6%
		<b>Cumulative Energy Unavailability Factor:</b>	20.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	515.0	914.0	74.7	74.7	74.7	74.7	75.2	75.2	571	76.7
1981	5949.2	920.0	81.2	80.7	81.2	80.7	73.8	73.9	7276	83.1
1982	2118.5	910.0	29.2	56.1	29.2	56.1	26.6	51.3	2732	31.2
1983	6130.0	910.0	77.9	63.2	77.9	63.2	76.9	59.6	6917	79.0
1984	5749.0	910.0	82.0	67.8	82.0	67.8	71.9	62.6	6751	76.9
1985	6829.7	910.0	90.2	72.2	89.7	72.1	85.7	67.1	7950	90.8
1986	6422.0	910.0	96.6	76.2	96.4	76.1	80.6	69.3	7956	90.8
1987	5357.9	910.0	77.4	76.4	75.2	75.9	67.2	69.0	6807	77.7
1988	5577.0	910.0	81.3	77.0	77.2	76.1	69.8	69.1	7227	82.3
1989	6412.9	910.0	84.6	77.8	83.6	76.9	80.4	70.4	7460	85.2
1990	6143.1	910.0	80.6	78.1	79.6	77.2	77.1	71.0	7164	81.8
1991	4915.9	910.0	63.6	76.8	63.0	75.9	61.7	70.2	5648	64.5
1992	6124.2	910.0	80.6	77.1	78.2	76.1	76.6	70.7	7149	81.4
1993	6219.9	910.0	82.3	77.5	79.3	76.3	78.0	71.3	7297	83.3
1994	6293.7	910.0	86.2	78.1	82.7	76.8	79.0	71.8	7638	87.2
1995	5599.7	910.0	75.6	77.9	74.6	76.6	70.2	71.7	6735	76.9
1996	5235.9	910.0	70.7	77.5	69.7	76.2	65.5	71.3	6361	72.4
1997	6641.2	910.0	98.0	78.7	97.8	77.5	83.3	72.0	8006	91.4
1998	5531.4	910.0	82.2	78.9	82.1	77.7	69.4	71.9	6896	78.7
1999	6394.4	910.0	87.8	79.3	85.3	78.1	80.2	72.3	7705	88.0
2000	5582.7	910.0	80.5	79.4	77.3	78.1	69.8	72.2	6952	79.1
2001	5984.5	910.0	85.5	79.7	85.0	78.4	75.1	72.3	7601	86.8
2002	5254.3	915.0	74.4	79.5	72.4	78.1	65.6	72.0	6658	76.0
2003	6553.9	910.0	89.6	79.9	89.2	78.6	82.2	72.5	7986	91.2
2004	6009.0	910.0	81.8	80.0	80.4	78.7	75.2	72.6	7262	82.7
2005	6622.6	910.0	88.2	80.3	86.6	79.0	83.1	73.0	7880	89.9
2006	6222.4	910.0	81.7	80.4	79.6	79.0	78.1	73.2	7369	84.1
2007	6522.6	910.0	88.0	80.6	86.4	79.3	81.8	73.5	7796	89.0
2008	6124.1	910.0	80.7	80.6	78.3	79.3	76.6	73.6	7271	82.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		308			157	
B. Refuelling without a maintenance outage				43		
C. Inspection, maintenance or repair combined with refuelling	1023			1004	43	
D. Inspection, maintenance or repair without refuelling				67		
E. Testing of plant systems or component	0			26		
H. Nuclear regulatory requirement		25				
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				20	46	56
L. Human factor related		159			5	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Others					4	
Subtotal	1023	492	0	1160	255	59
Total		1515			1474	

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		9
13. Reactor Auxiliary System:	2	12
14. Safety Systems	24	6
15. Reactor Cooling System:	20	24
16. Steam generation system:		22
21. Fuel Handling and Storage Facilities	31	0
31. Turbine and auxiliaries	61	11
32. Feedwater and Main Steam System	45	13
41. Main Generator System:	4	24
42. Electrical Power Supply System:	18	11
XX. Miscellaneous Systems	103	
Total	308	139

## FR-27 GRAVELINES-3

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6027.1 GW(e).h  
**Energy Availability Factor:** 76.5%  
**Load Factor:** 75.4%  
**Operating Factor:** 83.5%  
**Energy Unavailability Factor:** 23.5%  
**Total Off-line Time:** 1449 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	670.0	590.7	130.3	232.1	629.8	609.7	589.6	598.8	355.7	429.6	575.6	615.1	6027.1
<b>EAF (%)</b>	99.0	93.3	19.9	36.8	97.5	97.6	87.1	88.4	55.5	64.3	87.9	90.9	76.5
<b>UCF (%)</b>	100.0	100.0	22.8	36.8	98.3	99.2	90.1	92.0	57.5	65.6	88.9	92.2	78.6
<b>LF (%)</b>	99.0	93.3	19.2	35.4	93.0	93.1	87.1	88.4	54.3	63.5	87.9	90.9	75.4
<b>OF (%)</b>	100.0	100.0	22.8	43.5	100.0	100.0	100.0	100.0	63.9	72.0	100.0	100.0	83.5
<b>EUF (%)</b>	1.0	6.7	80.1	63.2	2.5	2.4	12.9	11.6	44.5	35.7	12.1	9.1	23.5
<b>PUF (%)</b>	0.0	0.0	77.2	28.6	1.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	9.0
<b>UCLF (%)</b>	0.0	0.0	0.0	34.6	0.6	0.6	9.9	8.0	42.5	34.4	11.2	7.8	12.4
<b>XUF (%)</b>	1.0	6.7	2.9	0.0	0.8	1.6	3.0	3.6	2.0	1.3	1.0	1.3	2.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Dec 1975	<b>Lifetime Generation:</b>	165152.2 GW(e).h
<b>Date of First Criticality:</b>	30 Nov 1980	<b>Cumulative Energy Availability Factor:</b>	79.4%
<b>Date of Grid Connection:</b>	12 Dec 1980	<b>Cumulative Load Factor:</b>	74.3%
<b>Date of Commercial Operation:</b>	01 Jun 1981	<b>Cumulative Unit Capability Factor:</b>	80.9%
		<b>Cumulative Energy Unavailability Factor:</b>	20.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	3699.8	920.0	84.4	84.4	84.4	84.4	78.3	78.3	4462	86.9
1982	3445.0	910.0	47.6	61.3	47.6	61.3	43.2	56.3	4260	48.6
1983	6006.0	910.0	78.6	68.0	78.5	67.9	75.3	63.6	7194	82.1
1984	6746.0	910.0	83.9	72.4	83.9	72.4	84.4	69.4	7505	85.4
1985	6294.4	910.0	80.1	74.1	80.1	74.1	79.0	71.5	7151	81.6
1986	6504.5	910.0	81.7	75.5	81.7	75.4	81.6	73.3	7335	83.7
1987	5382.9	910.0	75.5	75.5	74.3	75.3	67.5	72.4	6188	70.6
1988	4819.0	910.0	96.2	78.2	95.4	77.9	60.3	70.8	6724	76.5
1989	6307.7	910.0	82.3	78.7	79.5	78.1	79.1	71.8	7320	83.6
1990	6121.5	910.0	80.6	78.9	77.6	78.1	76.8	72.3	7114	81.2
1991	6306.3	910.0	81.3	79.1	80.5	78.3	79.1	73.0	7086	80.9
1992	4772.4	910.0	60.4	77.5	60.0	76.7	59.7	71.8	5388	61.3
1993	6588.1	910.0	85.2	78.1	82.9	77.2	82.6	72.7	7567	86.4
1994	6308.9	910.0	83.8	78.5	83.0	77.6	79.1	73.1	7116	81.2
1995	6221.7	910.0	84.3	78.9	83.0	78.0	78.0	73.5	7326	83.6
1996	5937.2	910.0	85.9	79.4	83.0	78.3	74.3	73.5	7377	84.0
1997	5752.7	910.0	81.1	79.5	78.9	78.3	72.2	73.4	6938	79.2
1998	6152.4	910.0	83.9	79.7	83.0	78.6	77.2	73.7	7330	83.7
1999	5412.9	910.0	79.1	79.7	76.9	78.5	67.9	73.4	6709	76.6
2000	6112.4	910.0	84.6	79.9	82.9	78.7	76.5	73.5	7396	84.2
2001	6198.0	910.0	92.6	80.6	83.9	79.0	77.8	73.7	7597	86.7
2002	5282.5	915.0	76.8	80.4	76.8	78.9	65.9	73.4	6401	73.1
2003	6045.5	910.0	85.8	80.6	85.8	79.2	75.8	73.5	7482	85.4
2004	6393.1	910.0	83.9	80.8	83.8	79.4	80.0	73.7	7499	85.4
2005	6075.9	910.0	78.9	80.7	77.2	79.3	76.2	73.8	7126	81.3
2006	6501.2	910.0	86.7	80.9	85.7	79.5	81.6	74.1	7834	89.4
2007	6265.6	910.0	81.4	80.9	79.6	79.6	78.6	74.3	7267	82.9
2008	6027.1	910.0	78.6	80.9	76.5	79.4	75.4	74.3	7335	83.5



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		710			281	
B. Refuelling without a maintenance outage	731			26	1	
C. Inspection, maintenance or repair combined with refuelling				995	27	
D. Inspection, maintenance or repair without refuelling				1		
E. Testing of plant systems or component				8	1	2
H. Nuclear regulatory requirement						1
J. Grid limitation, failure or grid unavailability						8
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					25	63
L. Human factor related		8			10	1
Z. Others					24	
Subtotal	731	718	0	1030	369	75
Total		1449			1474	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		9
13. Reactor Auxiliary System:		22
14. Safety Systems		4
15. Reactor Cooling System:		29
16. Steam generation system:	241	43
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries:		22
32. Feedwater and Main Steam System	68	11
41. Main Generator System:	401	74
42. Electrical Power Supply System:		17
XX. Miscellaneous Systems		6
Total	710	250

## FR-28 GRAVELINES-4

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6663.0 GW(e).h  
**Energy Availability Factor:** 85.0%  
**Load Factor:** 83.4%  
**Operating Factor:** 87.4%  
**Energy Unavailability Factor:** 15.0%  
**Total Off-line Time:** 1106 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	675.5	632.1	667.0	651.4	341.3	216.0	657.3	600.4	427.4	631.2	529.0	634.4	6663.0
<b>EAF (%)</b>	99.5	99.7	98.6	99.5	50.8	34.0	97.2	98.7	68.1	94.0	84.9	94.7	85.0
<b>UCF (%)</b>	99.6	99.8	98.7	99.7	51.3	34.0	98.2	99.8	69.3	95.3	85.9	97.0	85.8
<b>LF (%)</b>	99.8	99.8	98.5	99.4	50.4	33.0	97.1	88.7	65.2	93.2	80.7	93.7	83.4
<b>OF (%)</b>	99.9	100.0	99.9	100.0	51.6	40.0	100.0	100.0	71.3	96.8	88.9	99.9	87.4
<b>EUF (%)</b>	0.5	0.3	1.4	0.5	49.2	66.0	2.8	1.3	31.9	6.0	15.1	5.3	15.0
<b>PUF (%)</b>	0.0	0.1	0.1	0.0	48.5	63.7	1.8	0.0	0.0	0.1	0.2	0.0	9.5
<b>UCLF (%)</b>	0.4	0.2	1.2	0.3	0.3	2.3	0.0	0.2	30.7	4.6	13.9	3.0	4.7
<b>XUF (%)</b>	0.0	0.0	0.1	0.3	0.4	0.0	1.0	1.0	1.3	1.3	1.0	2.3	0.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

**Date of Construction Start:** 01 Apr 1976  
**Date of First Criticality:** 31 May 1981  
**Date of Grid Connection:** 14 Jun 1981  
**Date of Commercial Operation:** 01 Oct 1981

**Lifetime Generation:** 162998.1 GW(e).h  
**Cumulative Energy Availability Factor:** 79.0%  
**Cumulative Load Factor:** 74.6%  
**Cumulative Unit Capability Factor:** 80.4%  
**Cumulative Energy Unavailability Factor:** 21.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	1722.2	915.0	85.4	85.4	85.4	85.4	84.8	84.8	2031	92.0
1982	5498.2	910.0	80.8	81.7	80.8	81.7	69.0	72.2	7193	82.1
1983	4062.0	910.0	54.5	69.6	54.5	69.6	51.0	62.8	4986	56.9
1984	6006.0	910.0	82.8	73.7	82.8	73.7	75.1	66.6	7173	81.7
1985	6178.8	910.0	83.6	76.0	80.9	75.4	77.5	69.1	7387	84.3
1986	6556.6	910.0	88.7	78.4	88.6	77.9	82.2	71.6	7862	89.7
1987	5472.8	910.0	77.2	78.2	75.8	77.6	68.7	71.2	6787	77.5
1988	6221.0	910.0	87.9	79.6	85.9	78.7	77.8	72.1	7789	88.7
1989	4982.3	910.0	67.4	78.1	66.9	77.3	62.5	70.9	6025	68.8
1990	6151.7	910.0	79.4	78.2	77.2	77.3	77.2	71.6	7058	80.6
1991	6262.0	910.0	81.8	78.6	80.5	77.6	78.6	72.3	7067	80.7
1992	6419.8	910.0	81.0	78.8	80.2	77.8	80.3	73.0	7137	81.3
1993	4680.6	910.0	76.5	78.6	75.3	77.6	58.7	71.8	6112	69.8
1994	6039.3	910.0	83.3	79.0	82.5	78.0	75.8	72.1	6824	77.9
1995	6289.5	910.0	86.4	79.5	85.4	78.5	78.9	72.6	7313	83.5
1996	6288.4	910.0	85.5	79.9	83.2	78.8	78.7	73.0	7552	86.0
1997	5986.7	910.0	81.3	80.0	80.5	78.9	75.1	73.1	7206	82.3
1998	6519.3	910.0	85.4	80.3	84.1	79.2	81.8	73.6	7570	86.4
1999	5550.9	910.0	76.4	80.1	74.3	78.9	69.6	73.4	6734	76.9
2000	4563.6	910.0	69.5	79.5	57.7	77.8	57.1	72.6	5453	62.1
2001	5990.7	910.0	79.8	79.5	78.3	77.9	75.2	72.7	7094	81.0
2002	6028.1	915.0	81.2	79.6	80.1	78.0	75.2	72.8	7219	82.4
2003	5701.9	910.0	74.2	79.4	74.2	77.8	71.5	72.7	6589	75.2
2004	6544.6	910.0	85.4	79.6	85.4	78.1	81.9	73.1	7693	87.6
2005	6437.1	910.0	82.2	79.7	81.7	78.3	80.7	73.5	7354	83.9
2006	7123.1	910.0	91.5	80.2	89.9	78.7	89.4	74.1	8079	92.2
2007	6341.0	910.0	81.1	80.2	79.8	78.8	79.5	74.3	7164	81.8
2008	6663.0	910.0	85.8	80.4	85.0	79.0	83.4	74.6	7678	87.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		314			377	
B. Refuelling without a maintenance outage	775			22		
C. Inspection, maintenance or repair combined with refuelling				1047	10	
D. Inspection, maintenance or repair without refuelling				7	13	
E. Testing of plant systems or component				5	1	1
H. Nuclear regulatory requirement					10	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					11	34
L. Human factor related		16			3	
Z. Others					6	
Subtotal	775	330	0	1081	431	36
Total		1105			1548	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		20
12. Reactor I&C Systems		55
13. Reactor Auxiliary System:		3
14. Safety Systems	207	15
15. Reactor Cooling System:		35
16. Steam generation system:		65
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System	15	25
33. Circulating Water System		0
41. Main Generator System:	1	52
42. Electrical Power Supply System:		59
XX. Miscellaneous Systems:	91	
Total	314	362

# FR-51 GRAVELINES-5

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 6357.8 GW(e).h  
 Energy Availability Factor: 81.2%  
 Load Factor: 79.5%  
 Operating Factor: 83.7%  
 Energy Unavailability Factor: 18.8%  
 Total Off-line Time: 1433 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	659.7	595.2	586.7	643.4	547.3	288.9	0.0	461.5	642.0	654.6	625.0	653.5	6357.8
EAF (%)	99.4	96.4	88.4	99.4	81.4	45.0	0.0	68.8	98.0	99.4	99.4	99.7	81.2
UCF (%)	99.5	96.7	89.3	99.9	84.5	51.0	0.0	69.5	99.9	100.0	99.6	99.7	82.3
LF (%)	97.4	94.0	86.6	98.2	80.8	44.1	0.0	68.2	98.0	96.6	95.4	96.5	79.5
OF (%)	100.0	97.1	90.1	100.0	85.1	53.8	0.0	79.7	100.0	100.0	100.0	100.0	83.7
EUF (%)	0.6	3.6	11.6	0.6	18.6	55.0	100.0	31.2	2.0	0.6	0.6	0.3	18.8
PUF (%)	0.2	0.0	0.0	0.0	0.0	33.1	100.0	13.7	0.1	0.0	0.1	0.0	12.4
UCLF (%)	0.3	3.4	10.8	0.0	15.5	15.8	0.0	16.8	0.0	0.0	0.4	0.3	5.3
XUF (%)	0.1	0.2	0.9	0.5	3.1	6.0	0.0	0.7	1.9	0.6	0.1	0.0	1.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 144454.8 GW(e).h  
 Date of First Criticality: 05 Aug 1984      Cumulative Energy Availability Factor: 80.4%  
 Date of Grid Connection: 28 Aug 1984      Cumulative Load Factor: 75.0%  
 Date of Commercial Operation: 15 Jan 1985      Cumulative Unit Capability Factor: 82.2%  
    Cumulative Energy Unavailability Factor: 19.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	6768.4	910.0	90.1	90.1	90.0	90.0	84.9	84.9	7785	88.9
1986	5152.6	910.0	77.1	83.6	75.2	82.6	64.6	74.8	6673	76.2
1987	5236.5	910.0	81.5	82.9	80.6	82.0	65.7	71.7	6818	77.8
1988	4964.0	910.0	75.3	81.0	71.8	79.4	62.1	69.3	6306	71.8
1989	6020.6	910.0	81.0	81.0	80.6	79.7	75.5	70.6	7198	82.2
1990	5992.8	910.0	83.2	81.4	80.7	79.8	75.2	71.3	7367	84.1
1991	5276.2	910.0	72.2	80.0	69.6	78.4	66.2	70.6	6352	72.5
1992	6308.0	910.0	82.6	80.4	82.6	78.9	78.9	71.6	7361	83.8
1993	6180.5	910.0	82.7	80.6	78.6	78.9	77.5	72.3	7290	83.2
1994	5793.2	910.0	84.4	81.0	83.2	79.3	72.7	72.3	7147	81.6
1995	6181.0	910.0	87.6	81.6	86.0	79.9	77.5	72.8	7704	87.9
1996	5495.2	910.0	75.3	81.1	72.1	79.3	68.7	72.5	6652	75.7
1997	6429.9	910.0	87.6	81.6	86.1	79.8	80.7	73.1	7586	86.6
1998	6884.3	910.0	97.3	82.7	95.8	80.9	86.4	74.0	8286	94.6
1999	5124.3	910.0	68.1	81.7	67.0	80.0	64.3	73.4	6127	69.9
2000	5985.5	910.0	84.4	81.9	81.4	80.1	74.9	73.5	7444	84.7
2001	5762.6	910.0	80.2	81.8	78.2	80.0	72.3	73.4	6990	79.8
2002	6423.4	915.0	85.9	82.0	84.8	80.2	80.1	73.8	7662	87.5
2003	6473.4	910.0	85.1	82.2	84.3	80.5	81.2	74.2	7518	85.8
2004	6613.5	910.0	88.8	82.5	86.2	80.8	82.7	74.6	7836	89.2
2005	6410.0	910.0	84.0	82.6	81.7	80.8	80.4	74.9	7524	85.9
2006	5313.2	910.0	69.8	82.0	68.8	80.3	66.7	74.5	6313	72.1
2007	6510.2	910.0	85.4	82.2	83.5	80.4	81.7	74.8	7592	86.7
2008	6357.8	910.0	82.3	82.2	81.2	80.4	79.5	75.0	7352	83.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		407			313	
B. Refuelling without a maintenance				23		
C. Inspection, maintenance or repair combined with refuelling	1008			933	25	
D. Inspection, maintenance or repair without refuelling				3		
E. Testing of plant systems or component:	0			3	0	
H. Nuclear regulatory requirement					1	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					10	0
L. Human factor related		17			14	
Z. Others					1	
Subtotal	1008	424	0	962	364	1
Total		1432			1327	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	48	18
12. Reactor I&C Systems		13
13. Reactor Auxiliary System:	12	31
14. Safety Systems		0
15. Reactor Cooling System:		90
16. Steam generation system:		8
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		16
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator System:		40
42. Electrical Power Supply System:	299	48
XX. Miscellaneous Systems	48	
Total	407	281

## FR-52 GRAVELINES-6

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR

Net Reference Unit Power  
at the beginning of 2008: 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 2008

Net Energy Production: 5792.8 GW(e).h

Energy Availability Factor: 71.5%

Load Factor: 72.5%

Operating Factor: 72.7%

Energy Unavailability Factor: 28.5%

Total Off-line Time: 2401 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	636.8	651.6	691.1	667.2	683.6	593.2	618.2	678.7	572.3	0.0	0.0	0.0	5792.8
EAF (%)	91.9	100.0	99.9	100.0	99.6	89.9	91.7	100.0	86.6	-0.1	0.0	0.0	71.5
UCF (%)	91.9	100.0	99.9	100.0	99.6	90.3	91.7	100.0	86.6	-0.1	0.0	0.0	71.5
LF (%)	94.1	102.9	102.1	101.8	101.0	90.5	91.3	100.2	87.3	0.0	0.0	0.0	72.5
OF (%)	100.0	100.0	99.9	100.0	100.0	91.5	95.3	100.0	86.7	0.0	0.0	0.0	72.7
EUf (%)	8.1	0.0	0.1	0.0	0.4	10.1	8.3	0.0	13.4	100.1	100.0	100.0	28.5
PUF (%)	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	13.4	100.1	0.0	0.0	9.6
UCLF (%)	8.0	0.0	0.0	0.0	0.3	9.6	8.2	0.0	0.0	0.0	100.0	100.0	18.8
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

BASE LOAD

### 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 141852.6 GW(e).h

Date of First Criticality: 21 Jul 1985      Cumulative Energy Availability Factor: 79.8%

Date of Grid Connection: 01 Aug 1985      Cumulative Load Factor: 76.2%

Date of Commercial Operation: 25 Oct 1985      Cumulative Unit Capability Factor: 81.3%

   Cumulative Energy Unavailability Factor: 20.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	1740.9	910.0	88.7	88.7	88.6	88.6	86.6	86.6	2003	90.7
1986	5540.4	910.0	76.3	78.8	75.9	78.4	69.5	73.0	6677	76.2
1987	5583.9	910.0	80.6	79.6	80.1	79.2	70.0	71.7	7031	80.3
1988	6490.0	910.0	83.8	80.9	81.4	79.9	81.2	74.6	7453	84.8
1989	5177.3	910.0	71.2	78.6	71.1	77.8	64.9	72.3	6274	71.6
1990	6120.3	910.0	87.6	80.3	87.1	79.6	76.8	73.2	7553	86.2
1991	5888.2	910.0	78.5	80.0	77.5	79.2	73.9	73.3	6953	79.4
1992	5085.1	910.0	70.3	78.7	69.0	77.8	63.6	71.9	6246	71.1
1993	5293.6	910.0	82.0	79.1	73.4	77.3	66.4	71.3	6751	77.1
1994	6053.7	910.0	86.0	79.8	83.9	78.0	75.9	71.8	7487	85.5
1995	6769.4	910.0	89.8	80.8	88.8	79.1	84.9	73.1	7922	90.4
1996	6609.5	910.0	86.8	81.3	86.4	79.7	82.7	73.9	7755	88.3
1997	4545.4	910.0	60.6	79.6	59.5	78.1	57.0	72.5	5437	62.1
1998	6531.8	910.0	88.5	80.3	86.1	78.7	81.9	73.3	7746	88.4
1999	6141.4	910.0	80.9	80.4	80.3	78.8	77.0	73.5	7222	82.4
2000	6720.9	910.0	88.7	80.9	87.0	79.3	84.1	74.2	7887	89.8
2001	6148.7	910.0	82.2	81.0	80.2	79.4	77.1	74.4	7265	82.9
2002	6690.9	915.0	87.5	81.4	86.0	79.8	83.5	74.9	7784	88.9
2003	6462.6	910.0	83.3	81.5	82.5	79.9	81.1	75.3	7410	84.6
2004	6936.1	910.0	88.3	81.8	86.9	80.3	86.8	75.9	7850	89.4
2005	6536.5	910.0	84.3	81.9	82.4	80.4	82.0	76.2	7511	85.7
2006	7058.4	910.0	89.3	82.3	88.3	80.8	88.5	76.7	7907	90.3
2007	5455.7	910.0	69.1	81.7	68.4	80.2	68.4	76.4	6087	69.5
2008	5792.8	910.0	71.5	81.3	71.5	79.8	72.5	76.2	6383	72.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1461			305	3
B. Refuelling without a maintenance				28	3	
C. Inspection, maintenance or repair combined with refuelling	841			916	31	
D. Inspection, maintenance or repair without refuelling					22	
E. Testing of plant systems or component:				11		
H. Nuclear regulatory requirement					5	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			2		36	2
L. Human factor related		98			4	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.						1
Z. Others					8	
Subtotal	841	1559	2	955	414	7
Total		2402			1376	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	11	2
12. Reactor I&C Systems	64	17
13. Reactor Auxiliary Systems	1252	33
14. Safety Systems		16
15. Reactor Cooling Systems		35
16. Steam generation system		5
21. Fuel Handling and Storage Facilities	5	0
31. Turbine and auxiliaries		82
32. Feedwater and Main Steam System	60	17
33. Circulating Water System		0
41. Main Generator Systems		21
42. Electrical Power Supply Systems	64	44
XX. Miscellaneous Systems	5	0
Total	1461	272



# FR-58 NOGENT-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 8553.3 GW(e).h  
 Energy Availability Factor: 74.9%  
 Load Factor: 74.5%  
 Operating Factor: 80.5%  
 Energy Unavailability Factor: 25.1%  
 Total Off-line Time: 1708 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	962.2	823.4	497.6	0.0	204.0	574.6	922.2	920.2		954.2		855.3	8553.3
EAF (%)	98.7	90.0	52.1	-0.1	22.9	61.8	96.6	95.5		97.8		87.9	74.9
UCF (%)	99.9	99.4	63.1	-0.1	22.9	62.9	99.7	99.4		99.9		88.1	77.9
LF (%)	98.7	93.5	51.1	0.0	20.9	60.9	94.6	94.4		97.8		87.8	74.5
OF (%)	100.0	103.6	64.0	0.0	35.6	74.6	100.0	100.0		100.0		88.8	80.5
EUF (%)	1.3	10.0	47.9	100.1	77.1	38.2	3.4	4.5		2.2		12.1	25.1
PUF (%)	0.0	0.0	32.5	96.8	9.1	0.7	0.0	0.1		0.1		0.0	11.6
UCLF (%)	0.1	0.6	4.4	3.3	68.0	36.4	0.3	0.6		0.0		11.8	10.5
XUF (%)	1.2	9.4	11.0	0.0	0.0	1.1	3.1	3.9		2.2		0.3	3.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 26 May 1981      Lifetime Generation: 171808.3 GW(e).h  
 Date of First Criticality: 12 Sep 1987      Cumulative Energy Availability Factor: 76.9%  
 Date of Grid Connection: 21 Oct 1987      Cumulative Load Factor: 71.2%  
 Date of Commercial Operation: 24 Feb 1988      Cumulative Unit Capability Factor: 78.5%  
    Cumulative Energy Unavailability Factor: 23.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	7028.0	1310.0	88.5	88.5	87.6	87.6	66.7	66.7	6701	83.3
1989	3172.7	1310.0	30.2	58.1	28.3	56.7	27.6	46.3	2663	30.4
1990	6614.1	1310.0	67.7	61.4	67.5	60.4	57.6	50.2	5590	63.8
1991	6868.6	1310.0	64.2	62.1	62.9	61.0	59.9	52.7	5768	65.8
1992	7812.5	1310.0	71.5	64.0	70.4	62.9	67.9	55.8	6386	72.7
1993	7705.6	1310.0	72.2	65.4	68.5	63.9	67.1	57.7	6432	73.4
1994	8292.3	1310.0	83.2	68.0	80.1	66.2	72.3	59.8	7429	84.8
1995	7358.3	1310.0	84.3	70.0	83.9	68.5	64.1	60.3	6946	79.3
1996	8227.9	1310.0	81.1	71.3	79.6	69.7	71.5	61.6	7222	82.2
1997	8571.6	1310.0	83.7	72.5	81.1	70.9	74.7	62.9	7488	85.5
1998	6585.5	1310.0	59.2	71.3	57.2	69.6	57.4	62.4	5334	60.9
1999	9705.0	1310.0	92.5	73.1	91.8	71.5	84.6	64.3	8284	94.6
2000	9088.3	1310.0	85.2	74.0	83.0	72.4	79.0	65.4	7626	86.8
2001	9142.7	1310.0	84.7	74.8	83.8	73.2	79.7	66.4	7580	86.5
2002	9011.0	1310.0	87.3	75.6	87.1	74.1	78.5	67.2	7738	88.3
2003	9974.4	1310.0	98.3	77.0	98.0	75.6	86.9	68.5	8621	98.4
2004	8535.3	1310.0	81.0	77.3	77.8	75.7	74.2	68.8	7152	81.4
2005	8534.4	1310.0	76.5	77.2	75.1	75.7	74.4	69.1	6803	77.7
2006	9284.8	1310.0	82.9	77.5	82.9	76.1	80.9	69.8	7331	83.7
2007	10831.8	1310.0	96.5	78.5	94.5	77.0	94.4	71.0	8484	96.8
2008	8553.3	1310.0	77.9	78.5	74.9	76.9	74.5	71.2	7052	80.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		797			538	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling	935			912	1	
D. Inspection, maintenance or repair without refuelling				79		
E. Testing of plant systems or component	8			69		2
H. Nuclear regulatory requirement					15	
J. Grid limitation, failure or grid unavailability			1			
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					18	
L. Human factor related					9	1
Subtotal	943	797	1	1060	591	3
Total		1741			1654	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		75
12. Reactor I&C Systems	123	62
13. Reactor Auxiliary System:		1
14. Safety Systems		1
15. Reactor Cooling System:		28
16. Steam generation system:		117
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	63	55
32. Feedwater and Main Steam System	25	17
33. Circulating Water System	83	73
35. All other I&C Systems		0
41. Main Generator System:	503	66
42. Electrical Power Supply System:		4
Total	797	500

## FR-59 NOGENT-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 7594.2 GW(e).h  
 Energy Availability Factor: 66.9%  
 Load Factor: 66.2%  
 Operating Factor: 70.5%  
 Energy Unavailability Factor: 33.1%  
 Total Off-line Time: 2585 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	970.9	908.2	960.6	932.1	914.8			0.0	0.0	491.9	871.7	865.4	7594.2
EAF (%)	99.4	99.7	99.3	99.3	94.1			0.0	0.0	51.5	94.8	94.8	66.9
UCF (%)	99.9	99.9	99.7	100.0	99.9			0.0	0.0	51.7	95.1	95.1	68.7
LF (%)	99.6	103.2	98.6	99.0	93.9			0.0	0.0	50.4	92.4	88.8	66.2
OF (%)	100.0	103.6	99.9	100.1	100.0			0.0	0.0	58.8	100.0	100.0	70.5
EUF (%)	0.6	0.3	0.7	0.7	5.9			100.0	100.0	48.5	5.2	5.2	33.1
PUF (%)	0.0	0.1	0.0	0.0	0.0			13.2	0.0	5.7	0.0	0.0	11.2
UCLF (%)	0.1	0.0	0.3	0.0	0.1			86.8	100.0	42.7	4.9	4.9	20.1
XUF (%)	0.5	0.2	0.5	0.7	5.8			0.0	0.0	0.2	0.3	0.3	1.8

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Jan 1982      Lifetime Generation: 169690.6 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: 83.0%  
    Cumulative Energy Unavailability Factor: 19.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	5612.0	1310.0	78.9	78.9	78.9	78.9	72.8	72.8	4744	80.7
1990	7532.9	1310.0	69.4	73.2	68.3	72.6	65.6	68.5	6094	69.6
1991	8331.1	1310.0	78.8	75.3	73.5	72.9	72.6	70.1	7008	80.0
1992	8312.3	1310.0	77.4	75.9	74.1	73.2	72.2	70.7	6937	79.0
1993	9191.7	1310.0	85.9	78.0	80.8	74.8	80.1	72.7	7594	86.7
1994	6483.0	1310.0	98.0	81.5	94.8	78.4	56.5	69.8	6027	68.8
1995	7545.4	1310.0	78.4	81.1	75.9	78.0	65.8	69.2	6862	78.3
1996	8477.0	1310.0	80.5	81.0	77.0	77.9	73.7	69.8	7229	82.3
1997	8925.8	1310.0	86.0	81.6	82.0	78.3	77.8	70.7	7656	87.4
1998	8830.0	1310.0	98.0	83.3	97.8	80.3	76.9	71.4	7386	84.3
1999	7957.3	1310.0	76.2	82.6	74.7	79.8	69.3	71.2	6732	76.8
2000	9672.1	1310.0	85.9	82.9	84.6	80.2	84.1	72.3	7654	87.1
2001	9379.0	1310.0	85.1	83.1	83.4	80.5	81.7	73.0	7589	86.6
2002	8205.5	1310.0	84.2	83.2	84.2	80.7	71.5	72.9	7241	82.7
2003	9447.1	1310.0	91.5	83.7	91.5	81.5	82.3	73.6	7954	90.8
2004	8216.7	1310.0	78.6	83.4	75.1	81.1	71.4	73.4	7044	80.2
2005	8393.3	1310.0	77.2	83.0	76.1	80.8	73.1	73.4	6907	78.8
2006	10046.5	1310.0	89.5	83.4	89.5	81.3	87.5	74.2	7854	89.7
2007	9885.9	1310.0	89.5	83.7	86.9	81.6	86.1	74.8	7918	90.4
2008	7594.2	1310.0	68.7	83.0	66.9	80.8	66.2	74.4	6175	70.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1673			251	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	936			845		
E. Testing of plant systems or component				24		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					51	
L. Human factor related					5	
Z. Others					1	
Subtotal	936	1673	0	869	309	0
Total		2609			1178	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		24
13. Reactor Auxiliary System		11
14. Safety Systems		36
15. Reactor Cooling System		21
16. Steam generation system		38
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		22
32. Feedwater and Main Steam System		11
33. Circulating Water System		41
35. All other I&C Systems		7
41. Main Generator System	1673	11
42. Electrical Power Supply System		6
XX. Miscellaneous Systems		1
Total	1673	239

**FR-36 PALUEL-1**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR

Net Reference Unit Power  
at the beginning of 2008: 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 2008**

Net Energy Production: 9808.7 GW(e).h

Energy Availability Factor: 90.3%

Load Factor: 84.0%

Operating Factor: 92.4%

Energy Unavailability Factor: 9.7%

Total Off-line Time: 668 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	122.2	878.7	846.4	890.1	882.8	834.5	883.6	868.6	887.7	889.3	870.1	954.5	9808.7
EAF (%)	14.3	99.0	92.4	98.6	99.5	97.9	99.3	98.3	98.7	94.2	94.3	99.1	90.3
UCF (%)	14.3	99.5	93.0	99.9	100.0	98.5	100.0	99.0	99.9	95.5	95.3	100.0	91.1
LF (%)	12.4	94.9	85.5	93.0	89.2	87.1	89.3	87.8	92.7	89.9	90.9	96.5	84.0
OF (%)	25.4	100.0	93.1	100.0	100.0	100.0	100.0	100.0	100.0	95.8	95.7	100.0	92.4
EUF (%)	85.7	1.0	7.6	1.4	0.5	2.1	0.7	1.7	1.3	5.8	5.7	0.9	9.7
PUF (%)	9.1	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.8
UCLF (%)	76.7	0.0	7.0	0.1	0.0	1.5	0.0	0.9	0.0	4.6	4.7	0.0	8.1
XUF (%)	0.0	0.5	0.6	1.3	0.4	0.6	0.6	0.7	1.2	1.2	0.9	0.9	0.8

UCLF replaces previously used UUF.

**4. 2008 Summary of Operation**

LOAD FOLLOWING

**5. Historical Summary**

Date of Construction Start: 15 Aug 1977      Lifetime Generation: 194685.9 GW(e).h

Date of First Criticality: 13 May 1984      Cumulative Energy Availability Factor: 76.4%

Date of Grid Connection: 22 Jun 1984      Cumulative Load Factor: 70.5%

Date of Commercial Operation: 01 Dec 1985      Cumulative Unit Capability Factor: 78.2%

   Cumulative Energy Unavailability Factor: 23.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	947.5	1290.0	94.9	94.9	94.9	94.9	98.7	98.7	731	98.3
1986	5169.7	1290.0	52.3	55.7	50.2	53.7	45.7	49.9	4455	50.9
1987	8184.8	1330.0	77.0	66.0	76.6	64.9	70.3	59.8	6527	74.5
1988	9291.0	1330.0	96.8	76.1	95.3	74.8	79.5	66.3	7332	83.5
1989	7902.8	1330.0	72.6	75.3	70.4	73.7	67.8	66.7	6567	75.0
1990	7323.9	1330.0	70.1	74.2	66.4	72.3	62.9	65.9	6288	71.8
1991	7159.9	1330.0	66.7	73.0	63.2	70.8	61.5	65.2	5987	68.3
1992	8640.4	1330.0	76.6	73.5	76.6	71.6	74.0	66.4	6858	78.1
1993	8068.1	1330.0	77.2	74.0	70.9	71.5	69.2	66.8	6906	78.8
1994	6549.9	1330.0	77.1	74.3	76.9	72.1	56.2	65.6	5790	66.1
1995	8768.2	1330.0	82.2	75.1	79.6	72.9	75.3	66.6	7292	83.2
1996	5483.2	1330.0	52.7	73.1	48.7	70.7	46.9	64.8	4763	54.2
1997	9019.7	1330.0	84.5	74.0	83.8	71.8	77.4	65.8	7537	86.0
1998	9718.1	1330.0	91.3	75.3	91.2	73.3	83.4	67.2	8132	92.8
1999	8181.9	1330.0	78.6	75.6	76.2	73.5	70.2	67.4	6938	79.2
2000	9089.0	1330.0	84.0	76.1	83.5	74.1	77.8	68.1	7533	85.8
2001	9752.2	1330.0	98.3	77.5	97.6	75.6	83.7	69.1	8382	95.7
2002	7153.9	1330.0	68.3	77.0	66.6	75.1	61.4	68.6	6081	69.4
2003	8526.2	1330.0	77.6	77.0	77.2	75.2	73.2	68.9	6882	78.6
2004	8596.3	1330.0	79.4	77.1	77.4	75.3	73.6	69.1	7103	80.9
2005	10565.5	1330.0	98.4	78.2	97.9	76.4	90.7	70.2	8654	98.8
2006	7437.7	1330.0	68.6	77.7	66.0	75.9	63.8	69.9	6133	70.0
2007	8135.1	1330.0	75.1	77.6	73.3	75.8	69.8	69.9	6641	75.8
2008	9808.7	1330.0	91.1	78.2	90.3	76.4	84.0	70.5	8116	92.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		281			405	2
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling				1047	56	
D. Inspection, maintenance or repair without refuelling				144		
E. Testing of plant systems or component				26	0	
H. Nuclear regulatory requirement					15	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					49	0
L. Human factor related		388			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.			1			
Z. Others					1	
Subtotal	0	669	1	1217	552	3
Total		670			1772	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		24
12. Reactor I&C Systems	46	52
13. Reactor Auxiliary Systems	144	33
14. Safety Systems		4
15. Reactor Cooling System		15
16. Steam generation system		15
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries	59	40
32. Feedwater and Main Steam System		36
33. Circulating Water System		20
35. All other I&C Systems	32	
41. Main Generator System		124
42. Electrical Power Supply System		15
XX. Miscellaneous Systems		1
Total	281	385

## FR-37 PALUEL-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9315.6 GW(e).h  
 Energy Availability Factor: 84.0%  
 Load Factor: 79.7%  
 Operating Factor: 86.5%  
 Energy Unavailability Factor: 16.0%  
 Total Off-line Time: 1190 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	955.1	877.5	882.0	811.3	871.3	0.0	451.8	830.3	900.2	938.5	890.0	907.6	9315.6
EAF (%)	98.2	97.0	92.0	86.6	91.1	0.0	47.5	99.0	98.5	98.6	99.2	99.1	84.0
UCF (%)	99.9	98.4	93.3	88.0	92.6	0.0	48.3	100.0	99.6	99.8	100.0	100.0	85.1
LF (%)	96.5	94.8	89.1	84.7	88.1	0.0	45.7	83.9	94.0	94.7	92.9	91.7	79.7
OF (%)	100.0	100.0	93.4	89.9	93.3	0.0	59.9	100.0	100.0	100.0	100.0	100.0	86.5
EUF (%)	1.8	3.0	8.0	13.4	8.9	100.0	52.5	1.0	1.5	1.4	0.8	0.9	16.0
PUF (%)	0.1	0.0	0.2	0.0	2.8	96.7	9.6	0.0	0.0	0.0	0.0	0.0	9.0
UCLF (%)	0.0	1.6	6.5	12.0	4.6	3.3	42.0	0.0	0.3	0.2	0.0	0.0	5.9
XUF (%)	1.8	1.4	1.2	1.4	1.5	0.0	0.8	1.0	1.2	1.2	0.8	0.9	1.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Jan 1978      Lifetime Generation: 189263.4 GW(e).h  
 Date of First Criticality: 11 Aug 1984      Cumulative Energy Availability Factor: 73.7%  
 Date of Grid Connection: 14 Sep 1984      Cumulative Load Factor: 68.4%  
 Date of Commercial Operation: 01 Dec 1985      Cumulative Unit Capability Factor: 75.9%  
    Cumulative Energy Unavailability Factor: 26.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	990.5	1290.0	99.6	99.6	99.6	99.6	103.2	103.2	744	100.0
1986	6040.9	1290.0	52.3	56.0	52.2	55.9	53.5	57.4	4804	54.8
1987	8859.6	1290.0	77.3	66.2	76.8	66.0	78.4	67.4	6837	78.0
1988	7725.0	1330.0	75.5	69.3	73.5	68.5	66.1	67.0	6017	68.5
1989	8956.4	1330.0	83.4	72.8	80.1	71.3	76.9	69.5	7358	84.0
1990	6496.3	1330.0	59.1	70.1	59.1	68.9	55.8	66.7	5328	60.8
1991	6140.3	1330.0	55.1	67.6	54.9	66.6	52.7	64.4	4996	57.0
1992	6906.9	1330.0	63.6	67.0	61.7	65.9	59.1	63.7	5618	64.0
1993	7954.4	1330.0	87.9	69.6	76.9	67.3	68.3	64.2	7217	82.4
1994	7115.2	1330.0	77.6	70.5	74.5	68.1	61.1	63.9	6671	76.2
1995	6934.5	1330.0	70.5	70.5	65.8	67.8	59.5	63.4	6252	71.4
1996	8407.4	1330.0	83.8	71.7	78.5	68.8	72.0	64.2	7195	81.9
1997	8139.8	1330.0	83.9	72.7	83.5	70.0	69.9	64.7	7182	82.0
1998	7300.4	1330.0	73.1	72.8	69.1	70.0	62.7	64.5	6583	75.1
1999	9243.8	1330.0	85.6	73.7	84.1	71.0	79.3	65.6	7705	88.0
2000	9849.9	1330.0	96.0	75.2	94.4	72.5	84.3	66.8	8271	94.2
2001	7843.1	1330.0	76.7	75.3	76.0	72.7	67.3	66.9	6861	78.3
2002	7984.4	1330.0	73.2	75.1	72.0	72.7	68.5	67.0	6569	75.0
2003	8814.9	1330.0	82.1	75.5	81.1	73.2	75.7	67.4	7490	85.5
2004	9562.7	1330.0	92.6	76.4	89.9	74.1	81.9	68.2	8039	91.5
2005	7246.4	1330.0	65.3	75.9	64.5	73.6	62.2	67.9	5823	66.5
2006	8143.5	1330.0	74.4	75.8	73.9	73.6	69.9	68.0	6673	76.2
2007	7558.0	1330.0	68.3	75.5	66.8	73.3	64.9	67.9	6021	68.7
2008	9315.6	1330.0	85.1	75.9	84.0	73.7	79.7	68.4	7595	86.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		251			684	2
B. Refuelling without a maintenance	713			36	5	
C. Inspection, maintenance or repair combined with refuelling				938	115	
D. Inspection, maintenance or repair without refuelling				46		
E. Testing of plant systems or component:				19	1	
H. Nuclear regulatory requirement		145			2	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					24	0
L. Human factor related		81			0	
M. Governmental requirements or court decisions					1	
Z. Others					0	
Subtotal	713	477	0	1039	832	2
Total		1190			1873	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	36	20
12. Reactor I&C Systems	12	105
13. Reactor Auxiliary System:	22	8
14. Safety Systems	60	21
15. Reactor Cooling System:		81
16. Steam generation system:		34
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities	24	7
31. Turbine and auxiliaries	13	36
32. Feedwater and Main Steam System		8
33. Circulating Water System		74
35. All other I&C Systems	31	
41. Main Generator System:		233
42. Electrical Power Supply System:	53	23
XX. Miscellaneous Systems		2
Total	251	652



# FR-38 PALUEL-3

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 10106.5 GW(e).h  
 Energy Availability Factor: 96.6%  
 Load Factor: 86.5%  
 Operating Factor: 97.6%  
 Energy Unavailability Factor: 3.4%  
 Total Off-line Time: 214 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	839.6	792.1	878.1	814.0	713.3	776.5	881.2	838.4	865.4	858.1	937.1	912.7	10106.5
EAF (%)	99.5	96.1	99.2	95.2	98.8	96.3	93.7	99.7	99.5	90.3	98.6	92.2	96.6
UCF (%)	99.9	96.6	99.6	95.9	99.3	97.7	95.5	100.0	100.0	91.6	100.0	100.0	98.0
LF (%)	84.8	85.6	88.7	85.0	72.1	81.1	89.0	84.7	90.4	86.7	97.9	92.2	86.5
OF (%)	100.0	98.7	99.9	96.1	93.5	98.2	95.8	96.2	100.0	92.5	100.0	100.0	97.6
EUF (%)	0.5	3.9	0.8	4.8	1.2	3.7	6.3	0.3	0.5	9.7	1.4	7.8	3.4
PUF (%)	0.0	0.1	0.0	0.1	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.1
UCLF (%)	0.1	3.3	0.4	3.9	0.7	1.8	4.4	0.0	0.0	8.4	0.0	0.0	1.9
XUF (%)	0.4	0.4	0.4	0.8	0.5	1.5	1.8	0.3	0.5	1.2	1.3	7.8	1.4

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Feb 1979      Lifetime Generation: 185307.8 GW(e).h  
 Date of First Criticality: 07 Aug 1985      Cumulative Energy Availability Factor: 74.3%  
 Date of Grid Connection: 30 Sep 1985      Cumulative Load Factor: 68.7%  
 Date of Commercial Operation: 01 Feb 1986      Cumulative Unit Capability Factor: 75.9%  
    Cumulative Energy Unavailability Factor: 25.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	7395.7	1290.0	72.1	72.1	72.1	72.1	71.5	71.5	5759	71.8
1987	7716.6	1290.0	78.4	75.4	78.3	75.3	68.3	69.8	6104	69.7
1988	6763.0	1330.0	68.7	73.0	59.2	69.7	57.9	65.6	5413	61.6
1989	8124.4	1330.0	70.7	72.4	70.2	69.8	69.7	66.7	6288	71.8
1990	7322.0	1330.0	67.2	71.4	66.2	69.1	62.8	65.9	6008	68.6
1991	9587.1	1330.0	86.5	73.9	86.3	72.0	82.3	68.7	7634	87.1
1992	6886.6	1330.0	63.2	72.4	63.0	70.7	58.9	67.3	5671	64.6
1993	8459.0	1330.0	77.5	73.0	73.4	71.0	72.6	68.0	6951	79.3
1994	6703.6	1330.0	63.4	71.9	61.8	70.0	57.5	66.8	5590	63.8
1995	8733.3	1330.0	85.6	73.3	84.1	71.4	75.0	67.6	7598	86.7
1996	8027.7	1330.0	84.9	74.4	84.6	72.6	68.7	67.7	7261	82.7
1997	7618.8	1330.0	73.2	74.3	72.8	72.6	65.4	67.5	6494	74.1
1998	8327.0	1330.0	77.6	74.5	76.1	72.9	71.5	67.8	6913	78.9
1999	7636.7	1330.0	76.1	74.7	73.7	73.0	65.5	67.7	6505	74.3
2000	9819.8	1330.0	94.7	76.0	94.4	74.4	84.1	68.8	8199	93.3
2001	7815.9	1330.0	81.6	76.4	79.6	74.7	67.1	68.7	6796	77.6
2002	8900.5	1330.0	82.3	76.7	80.4	75.1	76.4	69.1	7366	84.1
2003	8181.7	1330.0	74.9	76.6	74.3	75.0	70.2	69.2	6567	75.0
2004	6395.5	1330.0	57.0	75.6	56.0	74.0	54.7	68.4	5147	58.6
2005	8157.6	1330.0	76.9	75.6	73.1	74.0	70.0	68.5	6573	75.0
2006	10549.6	1330.0	98.6	76.7	96.8	75.1	90.5	69.6	8671	99.0
2007	3908.8	1330.0	36.3	74.9	34.8	73.2	33.5	67.9	3402	38.8
2008	10106.5	1330.0	98.0	75.9	96.6	74.3	86.5	68.7	8570	97.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		137			743	
B. Refuelling without a maintenance				42	4	
C. Inspection, maintenance or repair combined with refuelling				961	40	
D. Inspection, maintenance or repair without refuelling				41		
E. Testing of plant systems or component				35	1	10
H. Nuclear regulatory requirement					5	
J. Grid limitation, failure or grid unavailability			0			
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			75		3	20
L. Human factor related		5			1	
Z. Others					2	
Subtotal	0	142	75	1079	799	30
Total		217			1908	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	57	52
12. Reactor I&C Systems		83
13. Reactor Auxiliary System:		43
14. Safety Systems		39
15. Reactor Cooling System:		81
16. Steam generation system:	9	6
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		13
31. Turbine and auxiliaries	60	27
32. Feedwater and Main Steam System	11	75
33. Circulating Water System		54
35. All other I&C Systems		0
41. Main Generator System:		171
42. Electrical Power Supply System:		49
XX. Miscellaneous Systems		2
Total	137	696

# FR-39 PALUEL-4

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 7962.6 GW(e).h  
 Energy Availability Factor: 69.6%  
 Load Factor: 68.2%  
 Operating Factor: 71.6%  
 Energy Unavailability Factor: 30.4%  
 Total Off-line Time: 2498 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	971.9	911.1	974.2	943.2	950.9	920.8	912.9	844.4	0.0	0.0	0.0	533.2	7962.6
EAF (%)	98.8	98.6	98.6	98.5	96.1	96.9	98.4	92.1	0.0	-0.1	0.0	56.3	69.6
UCF (%)	100.0	99.8	100.0	100.0	98.4	99.8	100.0	93.4	0.0	-0.1	0.0	57.9	70.8
LF (%)	98.2	98.4	98.5	98.5	96.1	96.2	92.3	85.3	0.0	0.0	0.0	53.9	68.2
OF (%)	100.0	100.0	99.9	100.0	100.0	100.0	100.0	93.5	0.0	0.0	0.0	64.4	71.6
EUF (%)	1.2	1.4	1.4	1.5	3.9	3.1	1.6	7.9	100.0	100.1	100.0	43.7	30.4
PUF (%)	0.0	0.1	0.1	0.0	0.1	0.0	0.0	6.6	100.0	100.1	93.3	6.4	25.5
UCLF (%)	0.0	0.1	0.0	0.0	1.5	0.2	0.0	0.0	0.0	0.0	6.7	35.7	3.7
XUF (%)	1.1	1.2	1.3	1.5	2.3	2.9	1.5	1.3	0.0	0.0	0.0	1.6	1.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 Feb 1980      Lifetime Generation: 185421.0 GW(e).h  
 Date of First Criticality: 29 Mar 1986      Cumulative Energy Availability Factor: 75.9%  
 Date of Grid Connection: 11 Apr 1986      Cumulative Load Factor: 70.2%  
 Date of Commercial Operation: 01 Jun 1986      Cumulative Unit Capability Factor: 77.7%  
    Cumulative Energy Unavailability Factor: 24.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	5171.6	1300.0	85.7	85.7	85.2	85.2	78.0	78.0	4298	83.7
1987	8014.6	1290.0	69.8	75.7	69.7	75.5	70.9	73.6	6289	71.8
1988	5909.0	1330.0	54.0	67.1	53.6	66.8	50.6	64.5	4812	54.8
1989	8268.3	1330.0	72.1	68.5	71.0	68.0	71.0	66.3	6349	72.5
1990	8067.7	1330.0	78.7	70.8	78.5	70.3	69.2	67.0	6770	77.3
1991	8325.6	1330.0	74.5	71.5	74.2	71.0	71.5	67.8	6677	76.2
1992	5553.3	1330.0	48.9	68.0	48.6	67.6	47.5	64.7	4529	51.6
1993	8683.8	1330.0	77.8	69.3	75.3	68.6	74.5	66.0	6938	79.2
1994	8329.7	1330.0	77.3	70.2	76.5	69.5	71.5	66.6	6945	79.3
1995	8346.8	1330.0	88.5	72.1	88.1	71.5	71.6	67.2	7354	83.9
1996	7848.1	1330.0	75.2	72.4	72.4	71.6	67.2	67.2	6745	76.8
1997	8633.7	1330.0	81.9	73.3	78.2	72.1	74.1	67.8	7219	82.4
1998	7776.7	1330.0	71.2	73.1	68.3	71.8	66.7	67.7	6506	74.3
1999	9879.7	1330.0	96.1	74.8	94.6	73.5	84.8	68.9	8345	95.3
2000	8358.8	1330.0	86.0	75.6	84.4	74.3	71.5	69.1	7532	85.7
2001	8581.0	1330.0	84.5	76.1	82.1	74.8	73.7	69.4	7489	85.5
2002	9303.3	1330.0	95.7	77.3	92.7	75.9	79.9	70.0	8216	93.8
2003	7960.7	1330.0	82.8	77.6	81.9	76.2	68.3	69.9	7307	83.4
2004	7138.6	1330.0	67.9	77.1	64.6	75.6	61.1	69.5	6027	68.6
2005	9682.1	1330.0	93.3	77.9	89.2	76.3	83.1	70.2	7949	90.7
2006	8270.8	1330.0	81.4	78.1	77.2	76.3	71.0	70.2	7320	83.6
2007	8421.5	1330.0	76.8	78.0	73.7	76.2	72.3	70.3	6824	77.9
2008	7962.6	1330.0	70.8	77.7	69.6	75.9	68.2	70.2	6286	71.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					563	1
B. Refuelling without a maintenance				57	3	
C. Inspection, maintenance or repair combined with refuelling	2185			907	13	
D. Inspection, maintenance or repair without refuelling				38		
E. Testing of plant systems or component				21	0	
H. Nuclear regulatory requirement					0	
J. Grid limitation, failure or grid unavailability						6
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					25	1
L. Human factor related		314				
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. Others					17	
Subtotal	2185	314	0	1023	621	9
Total		2499			1653	

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		96
12. Reactor I&C Systems		40
13. Reactor Auxiliary Systems		8
14. Safety Systems		16
15. Reactor Cooling Systems		37
16. Steam generation system		74
21. Fuel Handling and Storage Facilities		62
31. Turbine and auxiliaries		36
32. Feedwater and Main Steam System		15
33. Circulating Water System		2
41. Main Generator System		118
42. Electrical Power Supply System		36
Total	0	540

**FR-63 PENLY-1**

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR

Net Reference Unit Power  
at the beginning of 2008: 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 2008**

Net Energy Production: 10743.3 GW(e).h

Energy Availability Factor: 95.2%

Load Factor: 92.2%

Operating Factor: 96.2%

Energy Unavailability Factor: 4.8%

Total Off-line Time: 336 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	924.6	886.7	925.5	908.4	932.2	811.8	606.0	921.3	927.0	967.5	945.8	986.7	10743.3
EAF (%)	99.4	99.7	97.5	97.7	98.8	88.3	65.2	98.7	99.3	99.4	99.5	99.9	95.2
UCF (%)	99.6	99.8	97.6	97.8	99.0	88.7	65.6	99.6	99.9	99.7	99.6	100.0	95.5
LF (%)	93.4	99.2	93.5	95.0	94.2	84.8	61.2	93.1	96.8	97.6	98.8	99.7	92.2
OF (%)	100.0	103.4	97.6	100.1	98.9	88.9	65.9	100.0	100.0	100.0	100.0	100.0	96.2
EUF (%)	0.6	0.3	2.5	2.3	1.2	11.7	34.8	1.3	0.7	0.6	0.5	0.1	4.8
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
UCLF (%)	0.4	0.2	2.4	2.2	1.0	11.3	34.4	0.4	0.1	0.3	0.3	0.0	4.5
XUF (%)	0.2	0.1	0.0	0.1	0.2	0.4	0.4	0.8	0.6	0.3	0.1	0.1	0.3

UCLF replaces previously used UUF.

**4. 2008 Summary of Operation**

LOAD FOLLOWING

**5. Historical Summary**

Date of Construction Start: 01 Sep 1982      Lifetime Generation: 162963.3 GW(e).h

Date of First Criticality: 01 Apr 1990      Cumulative Energy Availability Factor: 82.0%

Date of Grid Connection: 04 May 1990      Cumulative Load Factor: 76.5%

Date of Commercial Operation: 01 Dec 1990      Cumulative Unit Capability Factor: 83.4%

   Cumulative Energy Unavailability Factor: 18.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1990	971.2	1330.0	98.9	98.9	98.9	98.9	98.2	98.2	738	99.2
1991	8436.7	1330.0	74.3	76.2	74.2	76.2	72.4	74.4	6645	75.9
1992	7922.2	1330.0	71.2	73.8	70.9	73.6	67.8	71.2	6315	71.9
1993	8023.9	1330.0	84.6	77.3	71.9	73.1	68.9	70.5	7298	83.3
1994	7969.1	1330.0	86.1	79.5	85.0	76.0	68.4	70.0	6654	76.0
1995	8879.1	1330.0	81.9	79.9	80.8	76.9	76.2	71.2	7248	82.7
1996	9530.8	1330.0	85.7	80.9	85.2	78.3	81.6	72.9	7625	86.8
1997	8503.4	1330.0	77.5	80.4	76.7	78.1	73.0	72.9	6872	78.4
1998	9965.7	1330.0	98.0	82.6	97.9	80.5	85.5	74.5	8140	92.9
1999	7998.5	1330.0	74.4	81.7	71.5	79.5	68.7	73.8	6633	75.7
2000	8271.7	1330.0	73.8	80.9	73.7	79.0	70.8	73.5	6640	75.6
2001	9825.8	1330.0	98.7	82.5	98.4	80.7	84.3	74.5	8304	94.8
2002	7146.7	1330.0	67.2	81.2	66.9	79.6	61.3	73.4	5948	67.9
2003	9290.8	1330.0	84.6	81.5	84.6	80.0	79.7	73.9	7525	85.9
2004	10500.2	1330.0	98.9	82.7	98.6	81.3	89.9	75.0	8733	99.4
2005	8491.3	1330.0	79.1	82.5	76.9	81.0	72.9	74.9	7104	81.1
2006	9533.1	1330.0	86.1	82.7	83.6	81.1	81.8	75.3	7656	87.4
2007	9243.6	1330.0	82.7	82.7	82.1	81.2	79.3	75.6	7356	84.0
2008	10743.3	1330.0	95.5	83.4	95.2	82.0	92.2	76.5	8424	96.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1990 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		355			281	0
B. Refuelling without a maintenance outage					2	
C. Inspection, maintenance or repair combined with refuelling				825	1	
D. Inspection, maintenance or repair without refuelling				204		
E. Testing of plant systems or component				23		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			3		4	
L. Human factor related		1			2	
Subtotal	0	356	3	1052	290	0
Total		359			1342	

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

System	2008 Hours Lost	1990 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		40
12. Reactor I&C Systems		9
13. Reactor Auxiliary System		24
14. Safety Systems		14
15. Reactor Cooling System	251	34
16. Steam generation system		43
17. Safety I&C Systems (excluding reactor I&C)		4
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		21
33. Circulating Water System		2
41. Main Generator System	17	29
42. Electrical Power Supply System	87	4
XX. Miscellaneous Systems		1
Total	355	252

## FR-64 PENLY-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9474.9 GW(e).h  
 Energy Availability Factor: 85.0%  
 Load Factor: 81.3%  
 Operating Factor: 86.6%  
 Energy Unavailability Factor: 15.0%  
 Total Off-line Time: 1170 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	983.9	916.1	979.4	776.5	0.0	584.5	899.8	733.3	872.4	874.4	895.7	958.9	9474.9
EAF (%)	99.3	98.9	99.1	81.4	0.0	64.2	99.1	90.2	97.6	93.4	98.4	99.5	85.0
UCF (%)	99.9	99.8	99.8	84.2	0.0	64.8	99.7	94.7	98.2	93.7	99.6	99.9	86.1
LF (%)	99.4	102.5	99.0	81.2	0.0	61.0	90.9	74.1	91.1	88.2	93.5	96.9	81.3
OF (%)	100.0	103.6	99.9	83.9	0.0	69.9	100.0	91.3	98.6	94.5	100.0	100.0	86.6
EUF (%)	0.7	1.1	0.9	18.6	100.0	35.8	0.9	9.8	2.4	6.6	1.6	0.5	15.0
PUF (%)	0.0	0.1	0.0	15.7	88.0	5.0	0.0	0.0	0.0	0.0	0.1	0.0	9.2
UCLF (%)	0.1	0.1	0.2	0.1	12.0	30.2	0.3	5.3	1.8	6.2	0.3	0.0	4.7
XUF (%)	0.5	1.0	0.7	2.8	0.0	0.6	0.6	4.4	0.6	0.4	1.3	0.5	1.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

### 5. Historical Summary

Date of Construction Start: 01 Aug 1984      Lifetime Generation: 147413.2 GW(e).h  
 Date of First Criticality: 10 Jan 1992      Cumulative Energy Availability Factor: 82.9%  
 Date of Grid Connection: 04 Feb 1992      Cumulative Load Factor: 76.6%  
 Date of Commercial Operation: 01 Nov 1992      Cumulative Unit Capability Factor: 84.1%  
    Cumulative Energy Unavailability Factor: 17.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1992	1970.8	1330.0	100.0	100.0	100.0	100.0	101.2	101.2	1464	100.0
1993	8611.8	1330.0	75.2	78.7	74.4	78.1	73.9	77.8	6658	76.0
1994	8759.7	1330.0	81.3	79.9	77.6	77.8	75.2	76.6	7228	82.5
1995	8169.7	1330.0	74.0	78.0	73.8	76.6	70.1	74.6	6574	75.0
1996	9758.0	1330.0	91.3	81.2	89.3	79.6	83.5	76.7	8025	91.4
1997	8068.9	1330.0	84.3	81.8	82.9	80.3	69.3	75.3	7186	82.0
1998	8877.5	1330.0	82.9	82.0	81.1	80.4	76.2	75.4	7318	83.5
1999	8637.0	1330.0	81.3	81.9	79.4	80.2	74.1	75.2	7203	82.2
2000	9584.5	1330.0	97.1	83.8	96.8	82.3	82.0	76.1	8393	95.5
2001	8816.2	1330.0	82.1	83.6	80.2	82.1	75.7	76.0	7333	83.7
2002	8464.3	1330.0	79.1	83.1	79.0	81.8	72.6	75.7	6890	78.7
2003	10207.8	1330.0	97.6	84.4	97.6	83.2	87.6	76.8	8603	98.2
2004	7225.8	1330.0	69.2	83.2	69.1	82.0	61.9	75.5	6231	70.9
2005	9102.6	1330.0	84.8	83.3	84.0	82.2	78.1	75.7	7546	86.1
2006	9885.2	1330.0	97.7	84.3	97.0	83.2	84.8	76.4	8447	96.4
2007	8718.7	1330.0	79.4	84.0	76.7	82.8	74.8	76.3	7081	80.8
2008	9474.9	1330.0	86.1	84.1	85.0	82.9	81.3	76.6	7590	86.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1992 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure	768	51	32	827	441	1
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling						
E. Testing of plant systems or component						
H. Nuclear regulatory requirement		328				
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					5	
L. Human factor related					1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.						
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.						
Z. Others					0	
Subtotal	768	379	32	876	447	1
Total	1179			1324		

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

System	2008 Hours Lost	1992 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	18	41
12. Reactor I&C Systems		25
13. Reactor Auxiliary System		16
14. Safety Systems		5
15. Reactor Cooling System		49
16. Steam generation system		14
21. Fuel Handling and Storage Facilities	33	2
31. Turbine and auxiliaries		43
32. Feedwater and Main Steam System		19
33. Circulating Water System		1
41. Main Generator System		1
42. Electrical Power Supply System		187
XX. Miscellaneous Systems	51	3
Total		406



## FR-10 PHENIX

**Operator:** CEA/EDF (Commissariat à l'Energie Atomique (80%))

**Contractor:** CNCLNEY (CNIM-CONSTRUCTIONS NAVALES ET INDUSTRIELLES DE MEDITERRANEE CL - CREUSOT LOIRE , NI

### 1. Station Details

**Type:** FBR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 130.0 MW(e)  
**Design Net Capacity:** 250.0 MW(e)  
**Design Discharge Burnup:** 100000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 664.6 GW(e).h  
**Energy Availability Factor:** 60.1%  
**Load Factor:** 58.4%  
**Operating Factor:** 60.6%  
**Energy Unavailability Factor:** 39.9%  
**Total Off-line Time:** 3448 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	41.4	51.9	64.7	93.0	47.9	0.0	80.9	71.2	0.0	65.7	56.5	91.5	664.6
<b>EAF (%)</b>	45.0	56.3	71.1	100.0	50.4	0.0	87.8	77.7	0.0	72.1	60.7	97.4	60.1
<b>UCF (%)</b>	45.0	56.3	79.4	100.0	50.4	0.0	87.8	86.4	0.0	72.1	60.7	97.5	61.6
<b>LF (%)</b>	42.8	59.4	66.9	99.5	49.5	0.0	83.6	73.6	0.0	67.8	60.4	94.6	58.4
<b>OF (%)</b>	45.2	60.0	71.5	100.1	50.4	0.0	88.4	78.0	0.0	71.9	62.1	97.4	60.6
<b>EUF (%)</b>	55.0	43.8	28.9	0.0	49.6	100.0	12.2	22.3	100.0	27.9	39.3	2.6	39.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	49.6	68.8	0.0	6.3	55.1	0.0	32.2	0.0	17.6
<b>UCLF (%)</b>	55.0	43.8	20.6	0.0	0.0	31.3	12.2	7.3	44.9	27.9	7.1	2.6	20.9
<b>XUF (%)</b>	0.0	0.0	8.3	0.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0	0.0	1.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

2008 SHOWS AN AVAILABILITY RATE STRICTLY IDENTICAL TO 2007 - 68.8% FOR A TARGET SET AT 80%. SEVERAL CONTINGENCIES ARE BEHIND THIS FAILURE TO MEET THE TARGET. IN THE END, THE REACTOR OPERATED FOR 217 DAYS, WHICH MAKES 2008 THE SECOND BEST YEAR FOR POWER GENERATION SINCE THE RESTART IN 2003. THE GROSS ELECTRICITY GENERATION WAS 725,481 MWH IN 2008. THE MARCOULE CENTRE WAS HEATED BY TAKING FROM THE PHÉNIX STEAM: 23,000 TONNES OF STEAM, I.E. SAVINGS OF 3,600 TONNES OF CO<sub>2</sub>. DURING THE MAJOR WORK IN OUTAGE A9, ELEVEN CONTINGENCIES DISTURBED THE SEQUENCE OF INTERVENTIONS; THE EXEMPLARY REACTION BY THE PERSONNEL REDUCED THE DELAY TO 13 DAYS AS TO COMPARE WITH A 36 DAY PLANNED PERIOD. THE A10 OUTAGE, INCLUDING THE MALFUNCTION OF A STEAM ISOLATION VALVE IN A STEAM GENERATOR, LASTED 18.5 DAYS MORE THAN PLANNED INITIALLY. THERE WERE NINE UNSCHEDULED OUTAGES DURING THE YEAR; THIS IS HIGH BUT HAD LITTLE IMPACT ON OUR ELECTRICITY GENERATION THANKS TO THE REACTION AND EFFICIENCY OF ALL CONCERNED. THE FIRST "END-OF-LIFE" TEST WAS CONCLUDED SUCCESSFULLY IN MAY 2008. IT INVOLVED MEASURING THE DECAY POWER OF THE CORE USING A CALORIMETRIC METHOD TO MONITOR CHANGES IN THE CORE TEMPERATURE. THE TRIPLE CERTIFICATION (ISO 9001, 14001 AND OHSAS 18001) OF OUR ACTIVITIES AND PROCESSES WAS OBTAINED BY THE DEN AT THE END OF 2008.

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1968  
**Date of First Criticality:** 31 Aug 1973  
**Date of Grid Connection:** 13 Dec 1973  
**Date of Commercial Operation:** 14 Jul 1974

**Lifetime Generation:** 24194.4 GW(e).h  
**Cumulative Energy Availability Factor:** 47.5%  
**Cumulative Load Factor:** 41.9%  
**Cumulative Unit Capability Factor:** 47.8%  
**Cumulative Energy Unavailability Factor:** 52.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	735.6	233.0	71.6	71.6	71.5	71.5	71.5	71.5	3515	79.6
1975	1308.4	233.0	64.1	66.6	64.1	66.6	64.1	66.6	5932	67.7
1976	950.8	233.0	47.4	58.9	46.7	58.6	46.5	58.5	4799	54.6
1977	300.8	233.0	15.9	46.6	15.5	46.3	14.7	46.0	2120	24.2
1978	1238.8	233.0	61.4	49.9	60.9	49.6	60.7	49.3	5905	67.4
1979	1719.0	233.0	84.0	56.1	84.0	55.8	84.2	55.6	7350	83.9
1980	1319.0	233.0	64.7	57.4	64.7	57.2	64.4	57.0	5679	64.7
1981	1421.9	233.0	69.9	59.1	69.9	58.9	69.7	58.7	6217	71.0
1982	989.1	233.0	48.7	57.9	48.7	57.7	48.5	57.5	5429	62.0
1983	1122.0	233.0	55.1	57.6	55.1	57.4	55.0	57.2	5515	63.0
1984	1414.0	233.0	53.7	57.2	53.7	57.0	69.1	58.3	6206	70.7
1985	1153.0	233.0	60.4	57.5	60.4	57.3	56.5	58.2	6784	77.4
1986	1519.1	233.0	73.2	58.7	73.2	58.6	74.4	59.5	6996	79.9
1987	1556.4	233.0	75.3	60.0	71.5	59.6	76.3	60.7	7059	80.6
1988	1475.4	233.0	72.0	60.8	71.4	60.4	72.1	61.5	6300	71.7
1989	601.2	233.0	30.4	58.8	29.6	58.4	29.5	59.4	2678	30.6
1990	982.5	233.0	47.9	58.2	47.9	57.8	48.1	58.8	4637	52.9
1991	0.0	233.0	58.6	58.2	58.6	57.8	0.0	55.4	0	0.0
1992	0.0	233.0	0.0	55.0	0.0	54.7	0.0	52.4	0	0.0
1993	34.8	233.0	94.1	57.1	94.1	56.7	1.7	49.8	286	3.3
1994	22.6	233.0	17.1	55.1	17.1	54.8	1.1	47.4	184	2.1
1995	Data not provided									
1996	2.7	233.0	0.0	52.5	0.0	52.2	0.1	45.2	0	0.0
1997	Data not provided									
1998	"									
1999	0.0	130.0	0.0	51.2	0.0	50.9	0.0	44.1	0	0.0
2000	0.0	130.0	0.0	49.9	0.0	49.6	0.0	43.0	0	0.0
2001	0.0	130.0	0.0	48.7	0.0	48.5	0.0	42.0	0	0.0
2002	0.0	130.0	0.0	47.6	0.0	47.3	0.0	41.0	0	0.0
2003	61.8	130.0	6.2	46.7	6.2	46.4	5.4	40.2	711	8.1
2004	626.9	130.0	55.1	46.8	55.1	46.6	54.9	40.5	4888	55.6
2005	804.5	130.0	71.8	47.4	71.2	47.1	70.6	41.2	6341	72.4
2006	591.0	130.0	51.9	47.5	51.9	47.2	51.9	41.4	4601	52.5
2007	565.1	130.0	49.6	47.5	49.6	47.3	49.6	41.6	4452	50.8
2008	664.6	130.0	61.6	47.8	60.1	47.5	58.4	41.9	5312	60.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1815			1049	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1540			597		
D. Inspection, maintenance or repair without refuelling				258	10	
E. Testing of plant systems or component					4	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1128		
J. Grid limitation, failure or grid unavailability			62			2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					6	2
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			65			
Subtotal	1540	1815	127	1983	1070	4
Total	3482			3057		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	79	64
12. Reactor I&C Systems		70
14. Safety Systems		0
15. Reactor Cooling System	447	230
16. Steam generation system	444	243
21. Fuel Handling and Storage Facilities		63
31. Turbine and auxiliaries	8	100
32. Feedwater and Main Steam System	395	66
33. Circulating Water System		1
41. Main Generator System	16	27
42. Electrical Power Supply System	54	7
XX. Miscellaneous Systems	372	168
Total	1815	1039

# FR-48 ST. ALBAN-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 5610.2 GW(e).h  
 Energy Availability Factor: 49.2%  
 Load Factor: 47.8%  
 Operating Factor: 52.1%  
 Energy Unavailability Factor: 50.8%  
 Total Off-line Time: 4207 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	46.2	715.9	944.1	941.9	947.8	120.8	0.0	0.0	0.0	99.0	825.7	968.9	5610.2
EAF (%)	7.4	77.7	95.8	99.3	98.6	14.9	0.0	0.0	0.0	12.2	86.7	99.3	49.2
UCF (%)	7.4	77.8	95.9	99.6	99.5	15.0	0.0	0.0	0.0	12.2	86.8	99.6	49.3
LF (%)	4.6	77.0	95.1	98.0	95.4	12.6	0.0	0.0	0.0	10.0	85.9	97.5	47.8
OF (%)	19.5	84.2	99.9	100.0	100.0	15.0	0.0	0.0	0.0	14.8	94.0	100.0	52.1
EUF (%)	92.6	22.3	4.2	0.7	1.4	85.1	100.0	100.0	100.0	87.8	13.3	0.7	50.8
PUF (%)	11.2	3.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.2
UCLF (%)	81.5	18.6	4.0	0.4	0.5	85.0	100.0	100.0	100.0	87.8	13.1	0.4	49.4
XUF (%)	0.0	0.1	0.2	0.2	0.9	0.1	0.0	0.0	0.0	0.0	0.2	0.3	0.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 29 Jan 1979      Lifetime Generation: 177286.4 GW(e).h  
 Date of First Criticality: 04 Aug 1985      Cumulative Energy Availability Factor: 73.8%  
 Date of Grid Connection: 30 Aug 1985      Cumulative Load Factor: 65.5%  
 Date of Commercial Operation: 01 May 1986      Cumulative Unit Capability Factor: 75.4%  
    Cumulative Energy Unavailability Factor: 26.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	3909.9	1300.0	67.6	67.6	66.4	66.4	51.1	51.1	3182	54.1
1987	6101.6	1300.0	56.6	61.0	56.2	60.3	53.6	52.6	4944	56.4
1988	4562.0	1335.0	83.4	69.6	82.4	68.7	38.9	47.4	3721	42.4
1989	6781.3	1335.0	70.7	69.9	63.5	67.3	58.0	50.3	5907	67.4
1990	7799.1	1335.0	70.4	70.0	68.6	67.6	66.7	53.8	6295	71.9
1991	7935.3	1335.0	74.4	70.8	73.3	68.6	67.9	56.3	6380	72.8
1992	4812.2	1335.0	42.1	66.4	42.1	64.6	41.0	54.0	3775	43.0
1993	7376.0	1335.0	68.2	66.7	65.7	64.7	63.1	55.2	6010	68.6
1994	7575.6	1335.0	94.5	69.9	93.8	68.1	64.8	56.3	6777	77.4
1995	8535.7	1335.0	81.1	71.1	78.2	69.2	73.0	58.0	7197	82.2
1996	8126.6	1335.0	83.7	72.2	83.1	70.5	69.3	59.1	6950	79.1
1997	7112.8	1335.0	65.5	71.7	63.6	69.9	60.8	59.3	5833	66.6
1998	8255.9	1335.0	90.6	73.2	89.9	71.5	70.6	60.2	6802	77.6
1999	9240.6	1335.0	86.3	74.1	85.7	72.5	79.0	61.5	7656	87.4
2000	8027.8	1335.0	72.2	74.0	71.4	72.4	68.5	62.0	6494	73.9
2001	9298.5	1335.0	89.8	75.0	89.6	73.5	79.5	63.1	7843	89.5
2002	8768.8	1335.0	81.0	75.4	79.6	73.9	75.0	63.8	7275	83.0
2003	8691.9	1335.0	80.6	75.7	78.0	74.1	74.3	64.4	7029	80.2
2004	10127.4	1335.0	96.6	76.8	95.3	75.3	86.4	65.6	8283	94.3
2005	9697.0	1335.0	88.6	77.4	86.0	75.8	82.9	66.5	7949	90.7
2006	8882.1	1335.0	82.5	77.6	78.4	75.9	76.0	67.0	7342	83.8
2007	6342.0	1335.0	55.9	76.6	54.6	74.9	54.2	66.4	4987	56.9
2008	5610.2	1335.0	49.3	75.4	49.2	73.8	47.8	65.5	4577	52.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		3739			578	
B. Refuelling without a maintenance				31	3	
C. Inspection, maintenance or repair combined with refuelling				1029	9	
D. Inspection, maintenance or repair without refuelling				68	0	
E. Testing of plant systems or component:	10			28		
H. Nuclear regulatory requirement		428			38	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					29	1
L. Human factor related		32			0	
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.						1
Z. Others					1	
Subtotal	10	4199	0	1156	658	6
Total		4209			1820	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	70	52
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		12
14. Safety Systems		12
15. Reactor Cooling Systems		119
16. Steam generation systems		5
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries	22	111
32. Feedwater and Main Steam System	105	42
33. Circulating Water System		3
35. All other I&C Systems		1
41. Main Generator Systems	3542	85
42. Electrical Power Supply Systems		62
XX. Miscellaneous Systems		6
Total	3739	537

# FR-49 ST. ALBAN-2

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 6270.9 GW(e).h  
 Energy Availability Factor: 54.7%  
 Load Factor: 53.5%  
 Operating Factor: 60.6%  
 Energy Unavailability Factor: 45.3%  
 Total Off-line Time: 3464 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	663.3	795.8	492.6	0.0	0.0	0.0	0.0	636.9	857.6	945.1	908.6	971.0	6270.9
EAF (%)	69.0	85.6	50.1	0.0	0.0	0.0	0.0	65.5	91.1	97.8	98.7	99.6	54.7
UCF (%)	69.9	98.7	68.2	0.0	0.0	0.0	0.0	67.1	97.8	98.3	98.9	99.7	58.1
LF (%)	66.8	85.7	49.6	0.0	0.0	0.0	0.0	64.1	89.2	95.2	94.5	97.8	53.5
OF (%)	83.7	100.0	68.0	0.0	0.0	0.0	0.0	82.8	93.9	99.3	100.0	100.0	60.6
EUF (%)	31.0	14.4	49.9	100.0	100.0	100.0	100.0	34.5	8.9	2.2	1.3	0.4	45.3
PUF (%)	0.0	0.0	31.8	100.0	100.0	100.0	54.6	16.4	0.0	0.1	0.0	0.0	33.6
UCLF (%)	30.1	1.3	0.0	0.0	0.0	0.0	45.4	16.5	2.2	1.6	1.1	0.3	8.3
XUF (%)	0.9	13.1	18.1	0.0	0.0	0.0	0.0	1.6	6.7	0.5	0.2	0.1	3.4

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 31 Jul 1979      Lifetime Generation: 169272.6 GW(e).h  
 Date of First Criticality: 07 Jun 1986      Cumulative Energy Availability Factor: 73.7%  
 Date of Grid Connection: 03 Jul 1986      Cumulative Load Factor: 65.5%  
 Date of Commercial Operation: 01 Mar 1987      Cumulative Unit Capability Factor: 76.3%  
    Cumulative Energy Unavailability Factor: 26.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	5639.8	1300.0	79.1	79.1	79.0	79.0	59.1	59.1	5014	68.3
1988	5185.0	1335.0	47.3	61.5	46.5	61.1	44.2	50.9	4308	49.0
1989	6126.5	1335.0	57.5	60.1	56.2	59.4	52.4	51.4	4806	54.9
1990	6070.6	1335.0	60.3	60.1	56.5	58.6	51.9	51.5	5146	58.7
1991	7962.6	1335.0	73.3	62.9	71.1	61.2	68.1	55.0	6484	74.0
1992	6375.1	1335.0	64.3	63.1	62.3	61.4	54.4	54.9	5405	61.5
1993	6433.1	1335.0	90.9	67.2	83.1	64.6	55.0	54.9	6121	69.9
1994	7125.8	1335.0	74.9	68.2	73.0	65.7	60.9	55.7	6074	69.3
1995	7751.4	1335.0	76.1	69.1	72.7	66.5	66.3	56.9	6763	77.2
1996	8344.6	1335.0	81.5	70.3	79.7	67.8	71.2	58.3	7247	82.5
1997	8049.7	1335.0	92.3	72.4	91.8	70.0	68.8	59.3	7072	80.7
1998	6555.7	1335.0	66.7	71.9	63.2	69.4	56.1	59.0	5654	64.5
1999	8607.0	1335.0	80.3	72.6	79.3	70.2	73.6	60.2	7188	82.1
2000	8729.6	1335.0	86.5	73.6	79.0	70.9	74.4	61.2	7202	82.0
2001	8654.8	1335.0	91.4	74.8	91.3	72.2	74.0	62.1	7657	87.4
2002	8290.6	1335.0	77.3	74.9	75.2	72.4	70.9	62.6	6950	79.3
2003	9254.8	1335.0	87.8	75.7	83.0	73.1	79.1	63.6	7558	86.3
2004	10476.5	1335.0	97.8	76.9	97.7	74.4	89.3	65.0	8709	99.1
2005	7238.0	1335.0	70.6	76.6	65.2	73.9	61.9	64.9	6361	72.6
2006	7584.2	1335.0	69.1	76.2	67.4	73.6	64.9	64.9	6292	71.8
2007	10476.0	1335.0	95.6	77.2	95.0	74.6	89.6	66.1	8660	98.9
2008	6270.9	1335.0	58.1	76.3	54.7	73.7	53.5	65.5	5320	60.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		464			715	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	2827	48		871	26	
D. Inspection, maintenance or repair without refuelling				84		
E. Testing of plant systems or component:	17			60	2	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			5		12	30
L. Human factor related		72			0	0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.			3			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.			41			
Subtotal	2844	584	49	1015	759	37
Total		3477			1811	

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	72	57
12. Reactor I&C Systems		62
13. Reactor Auxiliary Systems		13
14. Safety Systems		4
15. Reactor Cooling System		53
16. Steam generation system	242	107
21. Fuel Handling and Storage Facilities	24	0
31. Turbine and auxiliaries		122
32. Feedwater and Main Steam System	113	43
33. Circulating Water System		1
35. All other I&C Systems	3	0
41. Main Generator System	4	170
42. Electrical Power Supply System	6	14
XX. Miscellaneous Systems		3
Total	464	649

# FR-17 ST. LAURENT-B-1

Operator: EDF (ELECTRICITE DE FRANCE)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 6894.1 GW(e).h  
 Energy Availability Factor: 88.6%  
 Load Factor: 85.8%  
 Operating Factor: 91.5%  
 Energy Unavailability Factor: 11.4%  
 Total Off-line Time: 751 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	671.7	628.3	668.4	629.0	170.3	403.1	571.3	603.0	627.3	643.1	639.7	638.9	6894.1
EAF (%)	98.6	98.5	98.3	95.5	25.9	64.8	97.3	98.7	97.5	96.6	97.9	94.5	88.6
UCF (%)	99.9	99.8	99.9	99.9	29.3	66.2	99.2	99.8	99.2	97.9	99.9	99.0	90.8
LF (%)	98.7	98.7	98.2	95.5	25.0	61.2	83.9	88.6	95.2	94.3	97.1	93.9	85.8
OF (%)	100.0	100.0	99.9	100.0	29.3	72.1	100.0	100.0	100.0	100.0	100.0	96.9	91.5
EUf (%)	1.4	1.5	1.7	4.5	74.1	35.2	2.7	1.3	2.5	3.4	2.1	5.5	11.4
PUF (%)	0.1	0.2	0.1	0.1	70.7	21.9	0.1	0.2	0.1	0.1	0.2	0.1	7.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	12.0	0.8	0.0	0.7	2.0	0.0	1.0	1.4
XUF (%)	1.2	1.2	1.6	4.4	3.4	1.4	1.9	1.1	1.8	1.3	1.9	4.4	2.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

BASE LOAD JANUARY TO JUN AND LOAD FOLLOWING

## 5. Historical Summary

Date of Construction Start: 01 May 1976      Lifetime Generation: 148674.5 GW(e).h  
 Date of First Criticality: 04 Jan 1981      Cumulative Energy Availability Factor: 76.3%  
 Date of Grid Connection: 21 Jan 1981      Cumulative Load Factor: 72.6%  
 Date of Commercial Operation: 01 Aug 1983      Cumulative Unit Capability Factor: 77.9%  
    Cumulative Energy Unavailability Factor: 23.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	2970.0	880.0	92.0	92.0	92.0	92.0	91.9	91.9	3447	93.8
1984	4401.0	880.0	56.0	66.6	56.0	66.6	56.9	67.2	5042	57.4
1985	5630.4	880.0	76.1	70.5	75.0	70.1	73.0	69.6	6827	77.9
1986	5476.4	880.0	79.8	73.2	79.7	72.9	71.0	70.0	7144	81.6
1987	5171.3	880.0	76.8	74.0	76.1	73.6	67.1	69.4	6667	76.1
1988	5721.0	915.0	76.3	74.5	75.9	74.1	71.2	69.7	6464	73.6
1989	6609.8	915.0	85.4	76.2	82.7	75.4	82.5	71.8	7699	87.9
1990	6113.7	915.0	86.3	77.6	84.1	76.6	76.3	72.4	7089	80.9
1991	4005.4	915.0	53.7	74.7	52.3	73.7	50.0	69.7	4736	54.1
1992	5621.1	915.0	75.4	74.8	74.0	73.7	69.9	69.7	6690	76.2
1993	5668.5	915.0	75.3	74.8	72.4	73.6	70.7	69.8	6821	77.9
1994	6095.7	915.0	87.0	75.9	85.1	74.6	76.1	70.4	7252	82.8
1995	4443.0	915.0	64.3	75.0	60.3	73.4	55.4	69.1	5211	59.5
1996	5541.1	915.0	79.1	75.3	78.8	73.9	68.9	69.1	6888	78.4
1997	5132.6	915.0	76.2	75.3	75.4	74.0	64.0	68.8	6404	73.1
1998	6030.7	915.0	84.6	75.9	82.1	74.5	75.2	69.2	7366	84.1
1999	5062.6	915.0	69.7	75.6	67.9	74.1	63.2	68.8	6207	70.9
2000	5086.7	915.0	66.4	75.0	66.0	73.6	63.3	68.5	5957	67.8
2001	6814.8	915.0	86.8	75.7	86.4	74.3	85.0	69.4	7735	88.3
2002	6637.0	890.0	85.2	76.2	82.9	74.8	85.1	70.2	7592	86.7
2003	6630.4	915.0	86.5	76.7	82.8	75.2	82.7	70.8	7658	87.4
2004	6364.2	915.0	82.4	76.9	80.4	75.4	79.2	71.2	7356	83.7
2005	5384.1	915.0	69.5	76.6	68.1	75.1	67.2	71.0	6186	70.6
2006	6914.1	915.0	88.9	77.1	88.2	75.6	86.3	71.7	7973	91.0
2007	6426.7	915.0	83.1	77.4	80.5	75.8	80.2	72.0	7380	84.2
2008	6894.1	915.0	90.8	77.9	88.6	76.3	85.8	72.6	8034	91.5



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		78			500	
B. Refuelling without a maintenance				56	3	
C. Inspection, maintenance or repair combined with refuelling	648			1152	20	
E. Testing of plant systems or component	1			10	2	0
H. Nuclear regulatory requirement					0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					362	16
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.			24		2	
Z. Others					2	
Subtotal	649	78	24	1218	891	16
Total		751			2125	

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		39
13. Reactor Auxiliary System		17
14. Safety Systems		39
15. Reactor Cooling System		10
16. Steam generation system		79
21. Fuel Handling and Storage Facilities	78	2
31. Turbine and auxiliaries		51
32. Feedwater and Main Steam System		15
33. Circulating Water System		3
41. Main Generator System		167
42. Electrical Power Supply System		11
XX. Miscellaneous Systems		14
Total	78	459

# FR-18 TRICASTIN-1

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6808.2 GW(e).h  
**Energy Availability Factor:** 87.9%  
**Load Factor:** 84.7%  
**Operating Factor:** 90.5%  
**Energy Unavailability Factor:** 12.1%  
**Total Off-line Time:** 835 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	649.8	603.5	644.4	642.8	626.5	276.1	196.6	619.5	608.1	650.9	630.7	659.3	6808.2
<b>EAF (%)</b>	97.5	99.6	99.6	98.6	93.2	44.5	30.1	97.3	98.4	98.0	98.9	99.0	87.9
<b>UCF (%)</b>	98.7	100.0	100.0	99.9	100.0	49.6	30.1	99.1	100.0	99.9	100.0	100.0	89.7
<b>LF (%)</b>	95.5	94.8	94.7	97.6	92.0	41.9	28.9	91.0	92.3	95.5	95.7	96.8	84.7
<b>OF (%)</b>	100.0	100.0	99.9	100.0	100.0	50.3	36.0	100.0	100.0	100.0	100.0	100.0	90.5
<b>EUF (%)</b>	2.5	0.4	0.4	1.4	6.8	55.5	69.9	2.7	1.6	2.0	1.1	1.0	12.1
<b>PUF (%)</b>	0.1	0.0	0.0	0.1	0.0	49.7	28.5	0.9	0.0	0.0	0.0	0.0	6.6
<b>UCLF (%)</b>	1.2	0.0	0.0	0.0	0.0	0.7	41.4	0.0	0.0	0.1	0.0	0.0	3.7
<b>XUF (%)</b>	1.2	0.4	0.4	1.2	6.8	5.1	0.0	1.8	1.6	1.9	1.1	1.0	1.9

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Nov 1974	<b>Lifetime Generation:</b>	166188.3 GW(e).h
<b>Date of First Criticality:</b>	21 Feb 1980	<b>Cumulative Energy Availability Factor:</b>	77.2%
<b>Date of Grid Connection:</b>	31 May 1980	<b>Cumulative Load Factor:</b>	73.0%
<b>Date of Commercial Operation:</b>	01 Dec 1980	<b>Cumulative Unit Capability Factor:</b>	80.0%
		<b>Cumulative Energy Unavailability Factor:</b>	22.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	656.0	918.0	56.6	56.6	56.6	56.6	95.8	95.8	722	97.0
1981	4416.0	920.0	56.3	56.4	56.3	56.4	54.8	58.0	5176	59.1
1982	5909.8	915.0	82.8	69.0	81.9	68.6	73.7	65.5	8151	93.0
1983	5111.0	915.0	67.2	68.4	67.2	68.1	63.8	65.0	6097	69.6
1984	6468.0	915.0	86.7	72.9	86.7	72.7	80.5	68.8	7662	87.2
1985	6217.9	915.0	86.0	75.5	81.6	74.4	77.6	70.5	7560	86.3
1986	5880.3	915.0	79.4	76.1	77.0	74.9	73.4	71.0	7188	82.1
1987	5978.1	915.0	83.5	77.1	78.2	75.3	74.6	71.5	7360	84.0
1988	5836.0	915.0	79.8	77.5	76.7	75.5	72.6	71.6	7200	82.0
1989	5830.2	915.0	83.3	78.1	83.2	76.3	72.7	71.7	7550	86.2
1990	5099.7	915.0	68.8	77.2	65.1	75.2	63.6	70.9	6377	72.8
1991	5909.1	915.0	83.2	77.7	77.0	75.4	73.7	71.2	7262	82.9
1992	5659.3	915.0	85.3	78.4	83.0	76.0	70.4	71.1	7573	86.2
1993	6134.8	915.0	83.9	78.8	77.7	76.1	76.5	71.5	7393	84.4
1994	5008.4	915.0	75.4	78.5	70.3	75.7	62.5	70.9	6458	73.7
1995	5372.7	915.0	71.3	78.1	70.6	75.4	67.0	70.6	6374	72.8
1996	7302.1	915.0	94.5	79.1	93.8	76.5	90.9	71.9	8448	96.2
1997	5548.3	915.0	73.1	78.7	72.5	76.3	69.2	71.7	6711	76.6
1998	5503.7	915.0	71.0	78.3	71.0	76.0	68.7	71.6	7075	80.8
1999	3426.7	915.0	44.9	76.6	44.5	74.4	42.8	70.1	4016	45.8
2000	6644.9	915.0	87.7	77.1	87.1	75.0	82.7	70.7	7842	89.3
2001	6053.3	915.0	83.2	77.4	82.0	75.3	75.5	70.9	7261	82.9
2002	6384.6	880.0	87.2	77.8	86.1	75.8	82.8	71.4	7778	88.8
2003	5670.1	915.0	85.2	78.1	73.0	75.7	70.7	71.4	7029	80.2
2004	6832.5	915.0	91.5	78.7	89.0	76.2	85.0	72.0	8049	91.6
2005	5831.0	915.0	85.3	79.0	74.0	76.1	72.7	72.0	7007	80.0
2006	6466.8	915.0	90.7	79.4	87.4	76.6	80.7	72.3	7989	91.2
2007	6344.7	915.0	84.8	79.6	82.6	76.8	79.2	72.6	7496	85.6
2008	6808.2	915.0	89.7	80.0	87.9	77.2	84.7	73.0	7950	90.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		174			333	1
B. Refuelling without a maintenance				20	5	
C. Inspection, maintenance or repair combined with refuelling	526			1036	10	
D. Inspection, maintenance or repair without refuelling				21	2	
E. Testing of plant systems or component				4	0	
H. Nuclear regulatory requirement						2
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			1		30	
L. Human factor related		134			1	
Z. Others					1	
Subtotal	526	308	1	1081	382	5
Total		835			1468	

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	41	90
12. Reactor I&C Systems	13	5
13. Reactor Auxiliary System:		2
14. Safety Systems		3
15. Reactor Cooling System:		22
16. Steam generation system:		38
21. Fuel Handling and Storage Facilities	30	13
31. Turbine and auxiliaries		32
32. Feedwater and Main Steam System	72	8
33. Circulating Water System	18	
35. All other I&C Systems		0
41. Main Generator System:		82
42. Electrical Power Supply System:		14
Total	174	309

## FR-19 TRICASTIN-2

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 4884.4 GW(e).h  
**Energy Availability Factor:** 63.6%  
**Load Factor:** 60.8%  
**Operating Factor:** 65.7%  
**Energy Unavailability Factor:** 36.4%  
**Total Off-line Time:** 3016 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	611.7	569.2	642.2	626.4	640.9	609.6	638.6	545.7	0.0	0.0	0.0	0.0	4884.4
<b>EAF (%)</b>	93.0	94.1	99.4	99.1	98.4	98.8	96.4	84.3	0.0	-0.1	0.0	0.0	63.6
<b>UCF (%)</b>	94.1	94.8	100.0	100.0	99.9	99.9	100.0	93.0	0.0	-0.1	0.0	0.0	65.1
<b>LF (%)</b>	89.9	89.4	94.3	95.1	94.2	92.5	93.8	80.2	0.0	0.0	0.0	0.0	60.8
<b>OF (%)</b>	94.9	99.7	99.9	100.0	100.0	100.0	100.0	93.7	0.0	0.0	0.0	0.0	65.7
<b>EUF (%)</b>	7.0	5.9	0.6	0.9	1.6	1.2	3.6	15.7	100.0	100.1	100.0	100.0	36.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.1	0.0	6.7	100.0	43.8	0.0	0.0	12.5
<b>UCLF (%)</b>	5.9	5.2	0.0	0.0	0.0	0.0	0.0	0.3	0.0	56.3	100.0	100.0	22.4
<b>XUF (%)</b>	1.1	0.7	0.6	0.8	1.5	1.1	3.6	8.7	0.0	0.0	0.0	0.0	1.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Dec 1974	<b>Lifetime Generation:</b>	163229.8 GW(e).h
<b>Date of First Criticality:</b>	22 Jul 1980	<b>Cumulative Energy Availability Factor:</b>	76.5%
<b>Date of Grid Connection:</b>	07 Aug 1980	<b>Cumulative Load Factor:</b>	72.1%
<b>Date of Commercial Operation:</b>	01 Dec 1980	<b>Cumulative Unit Capability Factor:</b>	79.0%
		<b>Cumulative Energy Unavailability Factor:</b>	23.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	466.0	917.0	68.7	68.7	68.7	68.7	68.1	68.1	568	76.3
1981	6155.1	920.0	82.3	81.3	82.3	81.3	76.4	75.7	7819	89.3
1982	4056.2	915.0	63.0	72.5	63.0	72.5	50.6	63.7	5932	67.7
1983	5624.0	915.0	81.9	75.6	81.9	75.6	70.2	65.8	7245	82.7
1984	6603.0	915.0	87.2	78.4	87.2	78.4	82.2	69.8	7684	87.5
1985	6261.7	915.0	86.0	79.9	79.4	78.6	78.1	71.4	7375	84.2
1986	6286.6	915.0	85.8	80.9	82.6	79.3	78.4	72.6	7631	87.1
1987	5302.3	915.0	73.2	79.8	69.6	77.9	66.2	71.7	6500	74.2
1988	4896.0	915.0	76.0	79.3	73.1	77.3	60.9	70.3	6628	75.5
1989	5164.7	915.0	74.3	78.8	71.4	76.7	64.4	69.7	6650	75.9
1990	5614.4	915.0	80.9	79.0	72.5	76.2	70.0	69.7	7177	81.9
1991	4459.1	915.0	60.8	77.3	58.2	74.6	55.6	68.5	5429	62.0
1992	6099.1	915.0	80.0	77.6	78.7	75.0	75.9	69.1	7118	81.0
1993	5777.1	915.0	77.3	77.5	72.9	74.8	72.1	69.3	6876	78.5
1994	6216.7	915.0	81.7	77.8	79.1	75.1	77.6	69.9	7222	82.4
1995	6312.3	915.0	84.6	78.3	81.6	75.5	78.8	70.5	7504	85.7
1996	6391.3	915.0	84.9	78.7	82.1	75.9	79.5	71.0	7615	86.7
1997	5218.8	915.0	68.5	78.1	66.8	75.4	65.1	70.7	6107	69.7
1998	6293.9	915.0	83.0	78.4	81.2	75.7	78.5	71.1	7354	83.9
1999	5661.5	915.0	75.0	78.2	73.0	75.6	70.6	71.1	6674	76.2
2000	4293.8	915.0	56.7	77.1	55.3	74.6	53.4	70.2	5092	58.0
2001	6710.5	915.0	87.2	77.6	87.1	75.2	83.7	70.9	7779	88.8
2002	6593.9	880.0	86.6	78.0	86.3	75.7	85.5	71.5	7714	88.1
2003	6196.0	915.0	88.4	78.4	84.4	76.0	77.3	71.7	7521	85.9
2004	5684.2	915.0	86.4	78.8	80.7	76.2	70.7	71.7	7271	82.8
2005	5878.7	915.0	82.6	78.9	77.8	76.3	73.3	71.8	7128	81.4
2006	6221.3	915.0	83.0	79.1	80.7	76.5	77.6	72.0	7366	84.1
2007	6910.1	915.0	90.4	79.5	89.3	76.9	86.2	72.5	7989	91.2
2008	4884.4	915.0	65.1	79.0	63.6	76.5	60.8	72.1	5768	65.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1250			324	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	1093			1042	35	
D. Inspection, maintenance or repair without refuelling				35		
E. Testing of plant systems or component:				4	1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			1		34	42
L. Human factor related		674			1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						6
Z. Others					0	
Subtotal	1093	1924	1	1081	398	48
Total		3018			1527	

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	1187	4
12. Reactor I&C Systems		40
13. Reactor Auxiliary Systems		8
14. Safety Systems		21
15. Reactor Cooling System		42
16. Steam generation system		9
21. Fuel Handling and Storage Facilities		24
31. Turbine and auxiliaries		48
32. Feedwater and Main Steam System		8
41. Main Generator System	63	28
42. Electrical Power Supply System		10
XX. Miscellaneous Systems		1
Total	1250	243

## FR-25 TRICASTIN-3

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6185.2 GW(e).h  
**Energy Availability Factor:** 78.6%  
**Load Factor:** 76.9%  
**Operating Factor:** 80.0%  
**Energy Unavailability Factor:** 21.4%  
**Total Off-line Time:** 1755 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	674.5	632.7	670.1	489.0	0.0	0.0	511.0	603.3	629.6	663.3	647.8	663.9	6185.2
<b>EAF (%)</b>	99.9	99.9	98.7	74.6	0.0	0.0	75.9	98.3	99.6	98.9	99.9	97.5	78.6
<b>UCF (%)</b>	100.0	99.9	99.7	82.9	0.0	0.0	76.0	98.9	99.9	99.0	100.0	99.8	79.7
<b>LF (%)</b>	99.1	99.4	98.4	74.2	0.0	0.0	75.1	88.6	95.6	97.3	98.3	97.5	76.9
<b>OF (%)</b>	100.0	100.0	99.9	83.1	0.0	0.0	80.8	98.8	100.0	100.0	100.0	97.8	80.0
<b>EUF (%)</b>	0.1	0.1	1.3	25.4	100.0	100.0	24.1	1.7	0.4	1.1	0.1	2.5	21.4
<b>PUF (%)</b>	0.0	0.1	0.0	17.1	100.0	14.7	4.5	0.0	0.0	0.0	0.0	0.0	11.5
<b>UCLF (%)</b>	0.0	0.0	0.3	0.0	0.0	85.3	19.5	1.1	0.1	1.0	0.0	0.2	8.9
<b>XUF (%)</b>	0.0	0.0	1.0	8.2	0.0	0.0	0.2	0.6	0.3	0.1	0.1	2.3	1.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING



## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Apr 1975	<b>Lifetime Generation:</b>	168363.9 GW(e).h
<b>Date of First Criticality:</b>	29 Nov 1980	<b>Cumulative Energy Availability Factor:</b>	79.0%
<b>Date of Grid Connection:</b>	10 Feb 1981	<b>Cumulative Load Factor:</b>	75.6%
<b>Date of Commercial Operation:</b>	11 May 1981	<b>Cumulative Unit Capability Factor:</b>	81.3%
		<b>Cumulative Energy Unavailability Factor:</b>	21.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	3998.5	919.0	78.0	78.0	78.0	78.0	73.9	73.9	4815	81.9
1982	5067.3	915.0	65.8	70.7	65.8	70.7	63.2	67.5	5966	68.1
1983	6342.0	915.0	82.8	75.2	82.8	75.2	79.1	71.9	7544	86.1
1984	6682.0	915.0	85.1	77.9	85.1	77.9	83.1	74.9	7668	87.3
1985	7166.0	915.0	97.1	82.0	94.3	81.4	89.4	78.0	8518	97.2
1986	6230.4	915.0	86.8	82.9	83.5	81.8	77.7	78.0	7704	87.9
1987	5654.3	915.0	76.9	82.0	75.4	80.8	70.5	76.9	6810	77.7
1988	5722.0	915.0	80.3	81.7	78.0	80.5	71.2	76.1	7106	80.9
1989	5834.6	915.0	80.9	81.7	75.9	79.9	72.8	75.7	7188	82.1
1990	6457.2	915.0	85.8	82.1	84.6	80.4	80.6	76.2	7671	87.6
1991	4746.8	915.0	66.5	80.6	62.1	78.7	59.2	74.6	5941	67.8
1992	5199.0	915.0	67.5	79.5	66.6	77.7	64.7	73.8	6010	68.4
1993	6423.9	915.0	83.3	79.8	81.4	78.0	80.1	74.3	7373	84.2
1994	6496.5	915.0	86.3	80.3	83.6	78.4	81.1	74.8	7641	87.2
1995	6494.7	915.0	87.0	80.7	85.1	78.8	81.0	75.2	7675	87.6
1996	5806.7	915.0	79.3	80.6	76.2	78.7	72.2	75.0	7172	81.6
1997	6192.8	915.0	82.6	80.7	79.1	78.7	77.3	75.2	7331	83.7
1998	6359.5	915.0	82.3	80.8	80.5	78.8	79.3	75.4	7375	84.2
1999	5731.7	915.0	76.7	80.6	74.0	78.5	71.5	75.2	6828	77.9
2000	5985.2	915.0	82.3	80.7	79.0	78.6	74.5	75.1	7325	83.4
2001	4929.5	915.0	65.8	80.0	65.2	77.9	61.5	74.5	5777	65.9
2002	5976.1	880.0	79.7	80.0	79.4	78.0	77.5	74.6	7140	81.5
2003	6144.9	915.0	86.9	80.3	79.7	78.0	76.7	74.7	7607	86.8
2004	6377.1	915.0	84.3	80.4	82.9	78.3	79.3	74.9	7455	84.9
2005	6563.0	915.0	90.4	80.8	86.1	78.6	81.9	75.2	7981	91.1
2006	6006.9	915.0	86.5	81.1	81.3	78.7	74.9	75.2	7488	85.5
2007	6775.0	915.0	89.0	81.4	87.6	79.0	84.5	75.5	7862	89.7
2008	6185.2	915.0	79.7	81.3	78.6	79.0	76.9	75.6	7030	80.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		269			304	
B. Refuelling without a maintenance outage					12	
C. Inspection, maintenance or repair combined with refuelling	972			1036	9	
D. Inspection, maintenance or repair without refuelling				33		
E. Testing of plant systems or component				5	1	
H. Nuclear regulatory requirement					2	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			6		25	
L. Human factor related		493			0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			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.)					7	
Z. Others					1	
Subtotal	972	762	22	1074	361	0
Total		1756			1435	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	57	14
12. Reactor I&C Systems		42
13. Reactor Auxiliary Systems		13
14. Safety Systems	59	17
15. Reactor Cooling System		47
16. Steam generation system		4
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	11	53
32. Feedwater and Main Steam System	63	6
33. Circulating Water System		3
41. Main Generator System		84
42. Electrical Power Supply System	1	2
XX. Miscellaneous Systems	78	
Total	269	286

## FR-26 TRICASTIN-4

**Operator:** EDF (ELECTRICITE DE FRANCE)

**Contractor:** FRAM (FRAMATOME)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6016.6 GW(e).h  
**Energy Availability Factor:** 76.4%  
**Load Factor:** 74.8%  
**Operating Factor:** 78.2%  
**Energy Unavailability Factor:** 23.6%  
**Total Off-line Time:** 1918 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	666.6	516.5	661.4	644.5	655.7	614.8	203.9	0.0	94.0	664.2	629.1	666.0	6016.6
<b>EAF (%)</b>	100.0	83.3	99.9	99.2	99.2	94.8	30.4	0.0	15.1	98.4	97.5	99.7	76.4
<b>UCF (%)</b>	100.0	83.4	100.0	99.5	100.0	99.5	34.9	0.0	15.1	98.8	97.7	100.0	77.4
<b>LF (%)</b>	97.9	81.1	97.2	97.8	96.3	93.3	30.0	0.0	14.3	97.4	95.5	97.8	74.8
<b>OF (%)</b>	100.0	85.9	99.9	100.0	100.0	100.0	35.8	0.0	19.0	100.0	98.1	100.0	78.2
<b>EUF (%)</b>	0.0	16.7	0.1	0.8	0.8	5.2	69.6	100.0	84.9	1.6	2.5	0.3	23.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	64.6	90.6	3.8	0.6	0.0	0.0	13.5
<b>UCLF (%)</b>	0.0	16.6	0.0	0.5	0.0	0.5	0.6	9.4	81.2	0.7	2.3	0.0	9.1
<b>XUF (%)</b>	0.0	0.1	0.1	0.3	0.8	4.7	4.4	0.0	0.0	0.4	0.2	0.3	0.9

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

LOAD FOLLOWING

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1975	<b>Lifetime Generation:</b>	161726.3 GW(e).h
<b>Date of First Criticality:</b>	31 May 1981	<b>Cumulative Energy Availability Factor:</b>	79.2%
<b>Date of Grid Connection:</b>	12 Jun 1981	<b>Cumulative Load Factor:</b>	73.8%
<b>Date of Commercial Operation:</b>	01 Nov 1981	<b>Cumulative Unit Capability Factor:</b>	81.9%
		<b>Cumulative Energy Unavailability Factor:</b>	20.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	1283.6	917.0	97.2	97.2	97.2	97.2	95.3	95.3	1462	99.9
1982	5470.5	915.0	69.8	73.8	69.8	73.8	68.2	72.1	6311	72.0
1983	6170.0	915.0	80.7	77.0	80.7	77.0	77.0	74.4	7386	84.3
1984	5446.0	915.0	87.1	80.2	87.1	80.2	67.8	72.3	7587	86.4
1985	6161.7	915.0	91.3	82.8	84.8	81.3	76.9	73.4	7816	89.2
1986	5873.9	915.0	85.7	83.4	81.8	81.4	73.3	73.4	7568	86.4
1987	5725.7	915.0	84.2	83.5	80.1	81.2	71.4	73.0	7257	82.8
1988	3770.0	915.0	67.7	81.3	66.2	79.1	46.9	69.4	4772	54.3
1989	5729.1	915.0	82.9	81.5	79.8	79.2	71.5	69.7	7335	83.7
1990	5201.6	915.0	82.7	81.6	77.4	79.0	64.9	69.1	7329	83.7
1991	5742.8	915.0	77.1	81.2	74.5	78.5	71.6	69.4	6838	78.1
1992	6459.3	915.0	90.2	82.0	86.7	79.3	80.4	70.4	7968	90.7
1993	5302.8	915.0	80.1	81.8	70.9	78.6	66.2	70.0	6842	78.1
1994	5953.0	915.0	80.9	81.8	77.8	78.5	74.3	70.3	7049	80.5
1995	6208.9	915.0	85.7	82.0	82.0	78.8	77.5	70.8	7562	86.3
1996	6700.4	915.0	87.6	82.4	86.5	79.3	83.4	71.7	7774	88.5
1997	6488.8	915.0	86.0	82.6	84.8	79.6	81.0	72.2	7595	86.7
1998	5913.0	915.0	80.4	82.5	76.2	79.4	73.8	72.3	7138	81.5
1999	5887.9	915.0	80.5	82.4	78.0	79.3	73.5	72.4	7158	81.7
2000	5780.3	915.0	77.4	82.1	75.8	79.2	71.9	72.4	6873	78.2
2001	6036.9	915.0	83.0	82.2	81.2	79.3	75.3	72.5	7138	81.5
2002	6260.6	880.0	83.3	82.2	81.2	79.4	81.2	72.9	7168	81.8
2003	6387.9	915.0	82.9	82.3	79.9	79.4	79.7	73.2	7399	84.5
2004	4724.1	915.0	59.8	81.3	58.8	78.5	58.8	72.6	5359	61.0
2005	6501.4	915.0	88.8	81.6	83.6	78.7	81.1	72.9	7728	88.2
2006	6410.4	915.0	84.1	81.7	83.0	78.9	80.0	73.2	7412	84.6
2007	7047.0	915.0	92.2	82.1	90.4	79.3	87.9	73.8	8096	92.4
2008	6016.6	915.0	77.4	81.9	76.4	79.2	74.8	73.8	6867	78.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		291			225	0
B. Refuelling without a maintenance outage					1	
C. Inspection, maintenance or repair combined with refuelling	1152			1013	11	
D. Inspection, maintenance or repair without refuelling				20		
E. Testing of plant systems or component				1		
H. Nuclear regulatory requirement					0	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					78	10
L. Human factor related		475			7	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Others					3	
Subtotal	1152	766	0	1034	325	11
Total		1918			1370	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	95	23
12. Reactor I&C Systems	4	16
13. Reactor Auxiliary System	24	10
14. Safety Systems	83	30
15. Reactor Cooling System		21
16. Steam generation system		30
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		7
41. Main Generator System	14	41
42. Electrical Power Supply System	71	9
XX. Miscellaneous Systems		1
Total	291	202

## DE-12 BIBLIS-A (KWB A)

**Operator:** RWE (RWE Power AG)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1167.0 MW(e)  
**Design Net Capacity:** 1146.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 8472.8 GW(e).h  
**Energy Availability Factor:** 85.2%  
**Load Factor:** 82.9%  
**Operating Factor:** 88.8%  
**Energy Unavailability Factor:** 14.8%  
**Total Off-line Time:** 977 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	533.4	847.3	815.7	826.9	815.9	770.4	746.3	767.2	806.3	817.2	726.2	8472.8
<b>EAF (%)</b>	0.0	68.2	100.0	96.8	95.9	97.9	89.5	88.6	92.0	93.5	100.0	99.6	85.2
<b>UCF (%)</b>	0.0	68.2	100.0	96.8	96.7	99.9	99.3	100.0	100.0	100.0	100.0	99.6	88.4
<b>LF (%)</b>	0.0	68.0	97.6	97.2	95.2	97.1	88.7	86.0	91.3	92.7	97.3	83.6	82.9
<b>OF (%)</b>	0.0	72.6	99.9	97.5	97.6	100.0	100.0	98.4	100.0	100.0	100.0	100.0	88.8
<b>EUF (%)</b>	100.0	31.8	0.0	3.2	4.1	2.1	10.5	11.4	8.0	6.5	0.0	0.4	14.8
<b>PUF (%)</b>	100.0	31.8	0.0	3.2	3.3	0.0	0.1	0.0	0.0	0.0	0.0	0.4	11.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.0	0.0	0.0	0.0	0.0	0.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.7	1.9	9.8	11.4	8.0	6.5	0.0	0.0	3.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1970  
**Date of First Criticality:** 16 Jul 1974  
**Date of Grid Connection:** 25 Aug 1974  
**Date of Commercial Operation:** 26 Feb 1975

**Lifetime Generation:** 225138.0 GW(e).h  
**Cumulative Energy Availability Factor:** 69.5%  
**Cumulative Load Factor:** 65.7%  
**Cumulative Unit Capability Factor:** 70.0%  
**Cumulative Energy Unavailability Factor:** 30.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	7571.9	1146.0	82.4	82.4	82.4	82.4	82.4	82.4	6886	85.9
1976	5102.8	1146.0	60.2	70.8	52.7	66.9	50.7	65.8	4617	52.6
1977	6164.5	1089.0	65.4	69.0	65.4	66.4	64.6	65.4	5970	68.2
1978	7067.1	1089.0	70.0	69.3	70.0	67.3	74.1	67.6	6524	74.5
1979	6569.0	1089.0	87.4	72.9	87.4	71.3	68.9	67.8	7507	85.7
1980	3855.0	1146.0	42.5	67.6	42.5	66.3	38.3	62.7	4119	46.9
1981	6844.3	1146.0	69.6	67.9	69.6	66.8	68.2	63.5	6288	71.8
1982	8994.3	1146.0	86.6	70.3	86.6	69.3	89.6	66.9	7723	88.2
1983	7766.0	1146.0	75.8	70.9	75.8	70.1	77.4	68.1	6783	77.4
1984	6901.0	1146.0	67.9	70.6	67.9	69.8	68.6	68.1	6175	70.3
1985	7564.9	1146.0	79.2	71.4	75.1	70.3	75.4	68.8	6797	77.6
1986	6968.1	1146.0	76.9	71.9	76.9	70.9	69.4	68.8	7227	82.5
1987	7467.8	1146.0	80.9	72.6	80.9	71.7	74.4	69.3	7154	81.7
1988	5985.4	1146.0	72.5	72.6	72.5	71.7	59.5	68.6	6594	75.1
1989	6431.0	1146.0	66.9	72.2	66.9	71.4	64.1	68.3	5904	67.4
1990	5052.7	1146.0	53.1	71.0	53.1	70.2	50.3	67.1	4676	53.4
1991	6931.0	1146.0	76.3	71.3	76.3	70.6	69.0	67.2	6778	77.4
1992	6884.8	1146.0	79.6	71.8	79.6	71.1	68.4	67.3	7024	80.0
1993	8240.7	1146.0	97.5	73.1	97.5	72.5	82.1	68.1	8558	97.7
1994	7483.6	1146.0	76.8	73.3	76.8	72.7	74.5	68.4	6697	76.4
1995	2509.4	1156.0	30.0	71.2	30.0	70.7	24.8	66.3	2655	30.3
1996	4012.5	1167.0	39.7	69.7	39.7	69.2	39.1	65.0	3503	39.9
1997	8002.3	1167.0	87.0	70.5	87.0	70.0	78.3	65.6	7648	87.3
1998	10042.3	1167.0	99.7	71.8	99.7	71.3	98.2	67.0	8752	99.9
1999	7251.1	1167.0	78.0	72.0	78.0	71.5	70.9	67.2	6865	78.4
2000	5910.1	1167.0	62.5	71.6	62.5	71.2	57.7	66.8	5497	62.6
2001	9532.0	1167.0	94.9	72.5	94.9	72.1	93.2	67.8	8334	95.1
2002	6167.7	1167.0	68.1	72.3	68.1	71.9	60.3	67.5	5988	68.4
2003	2695.8	1167.0	26.6	70.7	26.6	70.3	26.4	66.1	2406	27.5
2004	9645.5	1167.0	95.2	71.6	95.2	71.2	94.1	67.0	8395	95.6
2005	7355.9	1167.0	73.4	71.6	72.7	71.2	71.9	67.2	6489	74.1
2006	6994.5	1167.0	70.6	71.6	69.3	71.2	68.4	67.2	6190	70.7
2007	0.0	1167.0	0.0	69.4	0.0	69.0	0.0	65.2	0	0.0
2008	8472.8	1167.0	88.4	70.0	85.2	69.5	82.9	65.7	7783	88.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					765	
B. Refuelling without a maintenance outage				7	2	
C. Inspection, maintenance or repair combined with refuelling				1371	2	
D. Inspection, maintenance or repair without refuelling	952			293		
E. Testing of plant systems or component	37			25	6	
H. Nuclear regulatory requirement					12	19
J. Grid limitation, failure or grid unavailability			12			
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				2	3	0
Subtotal	989	0	12	1698	790	19
Total	1001			2507		

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		20
13. Reactor Auxiliary System:		3
14. Safety Systems		376
15. Reactor Cooling System:		188
16. Steam generation system:		73
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		7
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		20
33. Circulating Water System		2
41. Main Generator System:		28
42. Electrical Power Supply System:		1
Total	0	759



## DE-18 BIBLIS-B (KWB B)

**Operator:** RWE (RWE Power AG)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1240.0 MW(e)  
**Design Net Capacity:** 1178.0 MW(e)  
**Design Discharge Burnup:** 33000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 10368.0 GW(e).h  
**Energy Availability Factor:** 96.1%  
**Load Factor:** 95.2%  
**Operating Factor:** 99.8%  
**Energy Unavailability Factor:** 3.9%  
**Total Off-line Time:** 19 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	917.3	854.4	899.5	886.7	894.6	863.3	868.6	865.5	864.7	903.9	836.4	713.1	10368.0
<b>EAF (%)</b>	100.0	99.7	98.0	100.0	99.3	97.4	96.3	95.0	97.6	98.6	94.4	77.9	96.1
<b>UCF (%)</b>	100.0	99.7	98.1	100.0	99.3	100.0	100.0	99.1	99.9	100.0	100.0	100.0	99.7
<b>LF (%)</b>	99.4	99.0	97.5	99.3	97.0	96.7	94.1	93.8	96.9	97.8	93.7	77.3	95.2
<b>OF (%)</b>	100.0	100.0	98.3	100.0	100.0	100.0	99.2	100.0	100.0	100.0	100.0	100.0	99.8
<b>EUF (%)</b>	0.0	0.3	2.0	0.0	0.7	2.6	3.7	5.0	2.4	1.4	5.6	22.1	3.9
<b>PUF (%)</b>	0.0	0.3	1.9	0.0	0.5	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	2.6	3.7	4.1	2.3	1.4	5.6	22.1	3.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Feb 1972	<b>Lifetime Generation:</b>	234561.4 GW(e).h
<b>Date of First Criticality:</b>	25 Mar 1976	<b>Cumulative Energy Availability Factor:</b>	74.1%
<b>Date of Grid Connection:</b>	25 Apr 1976	<b>Cumulative Load Factor:</b>	67.7%
<b>Date of Commercial Operation:</b>	31 Jan 1977	<b>Cumulative Unit Capability Factor:</b>	74.4%
		<b>Cumulative Energy Unavailability Factor:</b>	25.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	8017.2	1178.0	78.8	78.8	78.8	78.8	77.7	77.7	7490	85.5
1978	5658.0	1178.0	55.3	67.1	55.3	67.1	54.8	66.3	6015	68.7
1979	6026.0	1178.0	77.9	70.7	77.9	70.7	58.4	63.6	7254	82.8
1980	5592.0	1240.0	57.8	67.3	57.8	67.3	51.3	60.4	5761	65.6
1981	8105.6	1240.0	75.4	69.0	75.4	69.0	74.6	63.4	6804	77.7
1982	9196.0	1240.0	85.5	71.8	85.5	71.8	84.7	67.0	7681	87.7
1983	6490.0	1240.0	60.6	70.2	60.6	70.2	59.7	65.9	5360	61.2
1984	8216.0	1240.0	77.6	71.1	77.6	71.1	75.4	67.2	7338	83.5
1985	7780.2	1240.0	75.3	71.6	75.3	71.6	71.6	67.7	6918	79.0
1986	6722.6	1240.0	68.2	71.2	68.2	71.2	61.9	67.1	6370	72.7
1987	5623.0	1240.0	76.2	71.7	76.2	71.7	51.8	65.7	7273	83.0
1988	5591.8	1240.0	74.8	72.0	74.8	72.0	51.3	64.5	6593	75.1
1989	5165.8	1240.0	53.6	70.5	53.6	70.5	47.6	63.1	4807	54.9
1990	9100.1	1240.0	90.1	71.9	90.1	71.9	83.8	64.6	8631	98.5
1991	3917.8	1240.0	41.1	69.9	39.3	69.7	36.1	62.7	3626	41.4
1992	7630.5	1240.0	81.5	70.6	81.5	70.5	70.1	63.2	7184	81.8
1993	7441.8	1240.0	83.8	71.4	83.8	71.3	68.5	63.5	7368	84.1
1994	7973.8	1240.0	84.9	72.1	84.9	72.0	73.4	64.0	7468	85.3
1995	7854.2	1240.0	75.4	72.3	75.4	72.2	72.3	64.5	6603	75.4
1996	7857.4	1240.0	80.1	72.7	80.1	72.6	72.1	64.9	6762	77.0
1997	8469.4	1240.0	85.9	73.3	85.9	73.3	78.0	65.5	7560	86.3
1998	8182.1	1240.0	84.4	73.8	84.4	73.8	75.3	65.9	7409	84.6
1999	8707.4	1240.0	85.0	74.3	85.0	74.2	80.2	66.6	7474	85.3
2000	8295.7	1240.0	89.2	75.0	89.2	74.9	76.2	67.0	7950	90.5
2001	7442.2	1240.0	73.8	74.9	73.8	74.8	68.5	67.0	6470	73.9
2002	10173.6	1240.0	95.2	75.7	95.2	75.6	93.7	68.1	8371	95.6
2003	7792.0	1240.0	75.3	75.7	75.3	75.6	71.7	68.2	6630	75.7
2004	8768.4	1240.0	82.7	75.9	82.5	75.9	80.5	68.6	7309	83.2
2005	6892.5	1240.0	67.8	75.7	64.0	75.4	63.5	68.5	6014	68.7
2006	8312.1	1240.0	78.9	75.8	77.9	75.5	76.5	68.7	6929	79.1
2007	885.2	1240.0	8.2	73.6	8.2	73.3	8.1	66.8	731	8.3
2008	10368.0	1240.0	99.7	74.4	96.1	74.1	95.2	67.7	8766	99.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					462	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				1241		
D. Inspection, maintenance or repair without refuelling	12			44		
E. Testing of plant systems or component				2	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				238		
H. Nuclear regulatory requirement				15	35	
J. Grid limitation, failure or grid unavailability			6			
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Subtotal	12	0	6	1540	497	0
Total	18			2037		

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		28
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		66
15. Reactor Cooling System		161
16. Steam generation system		141
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		22
33. Circulating Water System		1
41. Main Generator System		25
Total	0	458

## DE-32 BROKDORF (KBR)

Operator: E.ON (E.ON Kernkraft GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 11450.4 GW(e).h  
 Energy Availability Factor: 94.1%  
 Load Factor: 92.7%  
 Operating Factor: 95.0%  
 Energy Unavailability Factor: 5.9%  
 Total Off-line Time: 440 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1021.5	959.6	1005.6	1013.5	1017.4	399.2	938.9	1011.2	1002.6	1037.8	1014.2	1028.7	11450.4
EAF (%)	100.0	99.9	100.0	100.0	98.8	39.3	90.8	100.0	100.0	100.0	100.0	99.9	94.1
UCF (%)	100.0	100.0	100.0	100.0	99.9	43.6	90.8	100.0	100.0	100.0	100.0	99.9	94.6
LF (%)	97.4	101.3	95.9	100.0	97.0	39.3	89.5	96.4	98.8	98.8	99.9	98.1	92.7
OF (%)	100.0	103.6	99.9	100.1	100.0	44.2	91.7	100.0	100.0	100.0	100.0	100.0	95.0
EUF (%)	0.0	0.1	0.0	0.0	1.2	60.7	9.2	0.0	0.0	0.0	0.0	0.1	5.9
PUF (%)	0.0	0.0	0.0	0.0	0.0	56.4	1.7	0.0	0.0	0.0	0.0	0.1	4.8
UCLF (%)	0.0	0.0	0.0	0.0	0.1	0.0	7.5	0.0	0.0	0.0	0.0	0.0	0.6
XUF (%)	0.0	0.0	0.0	0.0	1.1	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

REFERENCE UNIT POWER HAS BEEN INCREASED DUE TO REPLACEMENT FROM STATIONARY VANES OF HP-TURBINE

### 5. Historical Summary

Date of Construction Start: 01 Jan 1976      Lifetime Generation: 231479.3 GW(e).h  
 Date of First Criticality: 08 Oct 1986      Cumulative Energy Availability Factor: 90.4%  
 Date of Grid Connection: 14 Oct 1986      Cumulative Load Factor: 88.3%  
 Date of Commercial Operation: 22 Dec 1986      Cumulative Unit Capability Factor: 90.6%  
    Cumulative Energy Unavailability Factor: 9.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	296.8	1307.0	100.0	100.0	100.0	100.0	30.5	30.5	228	30.6
1987	9481.3	1307.0	85.2	86.3	85.2	86.3	82.8	78.7	7477	85.4
1988	8581.8	1326.0	85.2	85.8	85.2	85.8	73.7	76.3	7014	79.8
1989	8991.3	1326.0	80.0	83.9	80.0	83.9	77.4	76.6	7134	81.4
1990	8337.2	1326.0	72.5	81.1	72.5	81.1	71.8	75.4	6447	73.6
1991	9492.7	1326.0	85.7	82.0	85.7	82.0	81.7	76.7	7542	86.1
1992	10788.0	1326.0	96.0	84.3	96.0	84.3	92.6	79.3	8461	96.3
1993	9447.1	1326.0	85.6	84.5	84.8	84.4	81.3	79.6	7441	84.9
1994	10228.6	1326.0	88.7	85.0	88.7	84.9	88.1	80.6	7793	89.0
1995	9912.4	1326.0	86.6	85.2	86.6	85.1	85.3	81.2	7833	89.4
1996	10555.4	1326.0	93.2	86.0	93.2	85.9	90.6	82.1	8212	93.5
1997	11249.3	1326.0	95.1	86.8	95.1	86.7	96.8	83.4	8328	95.1
1998	10752.3	1326.0	92.6	87.3	90.4	87.0	92.6	84.2	7966	90.9
1999	11093.3	1370.0	93.3	87.8	93.3	87.5	92.4	84.8	8177	93.3
2000	11335.1	1370.0	95.6	88.3	95.6	88.1	94.2	85.5	8397	95.6
2001	11215.4	1370.0	95.0	88.8	95.0	88.6	93.5	86.1	8331	95.1
2002	11336.9	1370.0	95.8	89.2	95.8	89.0	94.5	86.6	8405	95.9
2003	10564.6	1370.0	90.1	89.3	90.1	89.1	88.0	86.7	7903	90.2
2004	11040.8	1370.0	94.7	89.6	94.7	89.4	91.7	87.0	8327	94.8
2005	11400.7	1370.0	96.1	89.9	95.9	89.8	95.0	87.4	8433	96.3
2006	11201.3	1370.0	94.7	90.2	93.7	90.0	93.3	87.7	8307	94.8
2007	11425.6	1370.0	94.5	90.4	94.3	90.2	95.2	88.1	8293	94.7
2008	11450.4	1410.0	94.6	90.6	94.1	90.4	92.7	88.3	8320	95.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					84	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	414			597		
D. Inspection, maintenance or repair without refuelling				8		
H. Nuclear regulatory requirement					47	7
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					9	3
L. Human factor related		50			0	
Z. Others					14	
Subtotal	414	50	0	605	168	10
Total		464			783	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		7
16. Steam generation system:		2
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		0
41. Main Generator System:		72
Total	0	81

## DE-13 BRUNSBUETTEL (KKB)

**Operator:** KKB (Kernkraftwerk Brunsbüttel GmbH)

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

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 771.0 MW(e)  
**Design Net Capacity:** 770.0 MW(e)  
**Design Discharge Burnup:** 32000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** -0.3%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.3%  
**Total Off-line Time:** 8760 hours

### 3. 2008 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	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
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	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.3
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.3
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. 2008 Summary of Operation

BRUNSBUETTEL WAS SHUTDOWN FOR THE WHOLE YEAR BECAUSE SPECIFIED MOUNTING FROM DOWELS HAD TO INSPECT

## 5. Historical Summary

**Date of Construction Start:** 15 Apr 1970  
**Date of First Criticality:** 23 Jun 1976  
**Date of Grid Connection:** 13 Jul 1976  
**Date of Commercial Operation:** 09 Feb 1977

**Lifetime Generation:** 120371.3 GW(e).h  
**Cumulative Energy Availability Factor:** 59.1%  
**Cumulative Load Factor:** 55.2%  
**Cumulative Unit Capability Factor:** 60.1%  
**Cumulative Energy Unavailability Factor:** 40.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	2925.9	770.0	47.4	47.4	47.4	47.4	47.4	47.4	4043	50.4
1978	2333.5	770.0	34.5	40.7	34.5	40.7	34.6	40.7	3405	38.9
1979	0.0	770.0	0.0	26.7	0.0	26.7	0.0	26.7	0	0.0
1980	714.9	770.0	11.3	22.8	11.3	22.8	10.6	22.6	1354	15.4
1981	4462.4	770.0	66.4	31.6	66.4	31.6	66.2	31.5	7432	84.8
1982	3439.2	770.0	51.1	34.9	51.1	34.9	51.0	34.8	5007	57.2
1983	2416.0	770.0	34.2	34.8	34.2	34.8	35.8	34.9	3241	37.0
1984	5334.0	770.0	78.9	40.4	78.9	40.4	78.9	40.5	7549	85.9
1985	5625.3	770.0	83.1	45.2	83.1	45.2	83.4	45.3	7661	87.5
1986	5630.9	771.0	86.1	49.3	86.1	49.3	83.4	49.1	7802	89.1
1987	5233.8	771.0	85.9	52.7	85.9	52.7	77.5	51.7	7837	89.5
1988	5085.3	771.0	85.4	55.4	85.4	55.4	75.1	53.7	7800	88.8
1989	4097.2	771.0	71.6	56.7	71.6	56.7	60.7	54.2	6730	76.8
1990	4780.3	771.0	93.8	59.4	93.8	59.4	70.8	55.4	8527	97.3
1991	3819.3	771.0	80.8	60.8	61.2	59.5	56.5	55.5	6317	72.1
1992	3487.4	771.0	57.4	60.6	57.4	59.3	51.5	55.2	5425	61.8
1993	0.0	771.0	0.0	57.0	0.0	55.8	0.0	52.0	0	0.0
1994	0.0	771.0	0.0	53.8	0.0	52.7	0.0	49.1	0	0.0
1995	3001.0	771.0	51.4	53.7	51.3	52.6	44.4	48.8	4750	54.2
1996	4696.4	771.0	77.9	54.9	74.7	53.8	69.3	49.9	7255	82.6
1997	5102.9	771.0	97.4	56.9	97.4	55.8	75.6	51.1	8760	100.0
1998	3993.9	771.0	64.7	57.3	64.7	56.2	59.1	51.5	5712	65.2
1999	6219.8	771.0	93.6	58.9	93.6	57.9	92.1	53.2	8290	94.6
2000	5784.8	771.0	93.8	60.3	93.8	59.4	85.4	54.6	8295	94.4
2001	5764.3	771.0	93.1	61.7	86.8	60.5	85.3	55.8	8202	93.6
2002	860.0	771.0	13.1	59.8	13.1	58.7	12.7	54.2	1167	13.3
2003	4905.8	771.0	76.3	60.4	76.3	59.3	72.6	54.8	6688	76.3
2004	4873.2	771.0	73.3	60.9	73.3	59.8	72.0	55.5	6504	74.0
2005	6027.2	771.0	90.3	61.9	89.0	60.8	89.2	56.6	7989	91.2
2006	5967.4	771.0	89.8	62.8	88.5	61.8	88.4	57.7	7958	90.8
2007	2487.9	771.0	38.2	62.0	38.2	61.0	36.8	57.0	3362	38.4
2008	0.0	771.0	-0.3	60.1	-0.3	59.1	0.0	55.2	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					1344	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				627	13	
D. Inspection, maintenance or repair without refuelling				418		
E. Testing of plant systems or component				0	2	
H. Nuclear regulatory requirement		8784		0	110	25
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	
M. Governmental requirements or court decisions						5
Z. Others					61	
Subtotal	0	8784	0	1045	1533	32
Total		8784			2610	

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary System:		686
15. Reactor Cooling System:		99
16. Steam generation system:		46
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		444
32. Feedwater and Main Steam System		0
35. All other I&C Systems:		0
41. Main Generator System:		7
42. Electrical Power Supply System:		47
Total	0	1332



## DE-33 EMSLAND (KKE)

Operator: KLE (Kernkraftwerke Lippe-Ems GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1329.0 MW(e)  
 Design Net Capacity: 1242.0 MW(e)  
 Design Discharge Burnup: 37000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 10896.2 GW(e).h  
 Energy Availability Factor: 93.4%  
 Load Factor: 93.6%  
 Operating Factor: 93.7%  
 Energy Unavailability Factor: 6.6%  
 Total Off-line Time: 549 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	994.7	932.3	995.7	961.8	972.4	196.5	975.4	965.2	952.5	990.4	962.5	996.8	10896.2
EAF (%)	100.0	100.0	100.0	100.0	98.6	20.8	100.0	100.0	100.0	100.0	100.0	100.0	93.4
UCF (%)	100.0	100.0	100.0	100.0	99.5	20.8	100.0	100.0	100.0	100.0	100.0	100.0	93.4
LF (%)	100.6	104.4	100.7	100.7	98.3	20.5	98.6	97.6	99.5	100.0	100.6	100.8	93.6
OF (%)	100.0	103.6	99.9	100.1	100.0	21.4	100.0	99.1	100.0	100.0	100.0	100.0	93.7
EUF (%)	0.0	0.0	0.0	0.0	1.4	79.2	0.0	0.0	0.0	0.0	0.0	0.0	6.6
PUF (%)	0.0	0.0	0.0	0.0	0.5	79.2	0.0	0.0	0.0	0.0	0.0	0.0	6.6
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	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

### 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: 220714.6 GW(e).h  
 Cumulative Energy Availability Factor: 93.4%  
 Cumulative Load Factor: 93.2%  
 Cumulative Unit Capability Factor: 93.5%  
 Cumulative Energy Unavailability Factor: 6.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	5694.9	1262.0	96.8	96.8	96.8	96.8	89.3	89.3	4516	87.9
1989	9857.2	1242.0	88.7	91.7	88.7	91.7	90.6	90.1	7794	89.0
1990	10039.2	1256.0	90.4	91.2	90.4	91.2	91.2	90.5	7956	90.8
1991	9287.3	1242.0	82.0	88.6	82.0	88.6	85.4	89.1	7304	83.4
1992	10158.0	1290.0	90.2	89.0	90.2	89.0	89.6	89.2	7933	90.3
1993	10477.1	1290.0	92.9	89.7	92.9	89.7	92.7	89.9	8147	93.0
1994	10526.7	1290.0	93.4	90.3	93.4	90.3	93.2	90.4	8193	93.5
1995	10495.7	1290.0	93.1	90.6	93.1	90.6	92.9	90.7	8168	93.2
1996	10557.3	1290.0	93.2	90.9	93.2	90.9	93.2	91.0	8195	93.3
1997	10650.2	1290.0	94.6	91.3	94.6	91.3	94.2	91.3	8298	94.7
1998	10794.7	1290.0	95.7	91.7	95.7	91.7	95.5	91.7	8388	95.8
1999	10729.2	1290.0	96.0	92.1	96.0	92.1	94.9	92.0	8413	96.0
2000	10802.0	1306.0	94.9	92.3	94.9	92.3	94.1	92.2	8339	94.9
2001	10933.2	1329.0	94.1	92.5	93.8	92.4	93.9	92.3	8257	94.3
2002	11242.3	1329.0	96.9	92.8	96.9	92.8	96.6	92.6	8497	97.0
2003	11097.0	1329.0	95.8	93.0	95.8	93.0	95.3	92.8	8401	95.9
2004	11147.2	1329.0	96.1	93.2	96.1	93.2	95.5	93.0	8456	96.3
2005	10887.8	1329.0	93.9	93.2	93.9	93.2	93.5	93.0	8239	94.0
2006	11147.6	1329.0	96.4	93.4	95.8	93.3	95.8	93.2	8461	96.6
2007	10989.2	1329.0	94.7	93.5	94.4	93.4	94.4	93.2	8311	94.9
2008	10896.2	1329.0	93.4	93.5	93.4	93.4	93.6	93.2	8211	93.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					27	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	566			451		
J. Grid limitation, failure or grid unavailability			7			
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	
L. Human factor related					3	
Z. Others					2	
Subtotal	566	0	7	451	32	0
Total	573			483		

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
15. Reactor Cooling System:		16
31. Turbine and auxiliaries:		3
41. Main Generator System:		6
42. Electrical Power Supply System:		0
Total	0	25

# DE-23 GRAFENRHEINFELD (KKG)

Operator: E.ON (E.ON Kernkraft GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1275.0 MW(e)  
 Design Net Capacity: 1225.0 MW(e)  
 Design Discharge Burnup: 45000 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 9763.0 GW(e).h  
 Energy Availability Factor: 88.4%  
 Load Factor: 87.4%  
 Operating Factor: 89.4%  
 Energy Unavailability Factor: 11.6%  
 Total Off-line Time: 932 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	949.2	887.2	845.6	0.0	661.1	881.9	920.8	921.6	900.2	939.5	911.7	944.1	9763.0
EAF (%)	100.0	100.0	89.3	-0.1	71.2	100.0	100.0	100.0	100.0	100.0	100.0	99.8	88.4
UCF (%)	100.0	100.0	92.0	-0.1	73.4	100.0	100.0	100.0	100.0	100.0	100.0	99.8	88.8
LF (%)	100.1	103.6	89.1	0.0	69.7	96.1	97.1	97.2	98.1	98.9	99.3	99.5	87.4
OF (%)	100.0	103.6	92.5	0.0	75.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.4
EUf (%)	0.0	0.0	10.7	100.1	28.8	0.0	0.0	0.0	0.0	0.0	0.0	0.2	11.6
PUf (%)	0.0	0.0	8.0	77.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1
UCLF (%)	0.0	0.0	0.0	22.8	26.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	4.1
XUF (%)	0.0	0.0	2.7	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jan 1975      Lifetime Generation: 255101.3 GW(e).h  
 Date of First Criticality: 09 Dec 1981      Cumulative Energy Availability Factor: 88.1%  
 Date of Grid Connection: 30 Dec 1981      Cumulative Load Factor: 86.4%  
 Date of Commercial Operation: 17 Jun 1982      Cumulative Unit Capability Factor: 88.2%  
    Cumulative Energy Unavailability Factor: 11.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1982	6199.2	1229.0	98.3	98.3	98.3	98.3	98.2	98.2	5122	99.7
1983	9412.0	1229.0	87.5	91.5	87.5	91.5	87.4	91.4	7898	90.2
1984	9590.0	1229.0	88.7	90.4	88.7	90.4	88.8	90.4	7890	89.8
1985	9741.6	1235.0	90.6	90.4	90.6	90.4	90.0	90.3	8155	93.1
1986	8718.2	1235.0	80.9	88.3	80.9	88.3	80.6	88.2	7179	82.0
1987	8360.6	1235.0	77.8	86.5	77.8	86.5	77.3	86.2	7509	85.7
1988	8799.9	1235.0	84.3	86.1	84.3	86.1	81.1	85.5	7604	86.6
1989	9401.7	1235.0	88.0	86.4	88.0	86.4	86.9	85.6	7840	89.5
1990	7910.3	1235.0	73.5	84.9	73.5	84.9	73.1	84.2	6743	77.0
1991	9753.5	1235.0	92.5	85.7	92.5	85.7	90.2	84.8	8114	92.6
1992	9657.2	1235.0	91.8	86.3	91.8	86.3	89.0	85.2	8074	91.9
1993	8845.9	1235.0	84.5	86.1	84.5	86.1	81.8	84.9	7524	85.9
1994	9674.5	1275.0	88.8	86.3	88.8	86.3	86.6	85.0	8116	92.6
1995	9946.0	1275.0	93.5	86.9	93.5	86.9	89.1	85.4	8193	93.5
1996	9528.6	1275.0	89.1	87.0	89.1	87.0	85.1	85.3	7886	89.8
1997	10131.0	1275.0	93.5	87.5	93.5	87.4	90.7	85.7	8202	93.6
1998	9147.0	1275.0	84.6	87.3	84.6	87.3	81.9	85.5	7429	84.8
1999	8336.7	1275.0	76.1	86.6	76.1	86.6	74.6	84.8	6737	76.9
2000	9600.9	1275.0	89.1	86.8	89.1	86.8	85.7	84.9	7829	89.1
2001	10573.9	1275.0	95.7	87.2	95.7	87.2	94.7	85.4	8392	95.8
2002	9889.9	1275.0	91.0	87.4	91.0	87.4	88.5	85.5	7977	91.1
2003	10270.2	1275.0	93.4	87.7	93.4	87.7	92.0	85.8	8196	93.6
2004	10129.4	1275.0	91.6	87.9	91.6	87.9	90.4	86.0	8059	91.7
2005	10106.0	1275.0	91.8	88.0	91.5	88.0	90.5	86.2	8046	91.8
2006	9424.9	1275.0	85.2	87.9	84.9	87.9	84.4	86.2	7588	86.6
2007	10311.5	1275.0	93.6	88.1	93.4	88.1	92.3	86.4	8236	94.0
2008	9763.0	1275.0	88.8	88.2	88.4	88.1	87.4	86.4	7828	89.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		344			168	
C. Inspection, maintenance or repair combined with refuelling	611			733	4	
Z. Others					5	
Subtotal	611	344	0	733	177	0
Total		955			910	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	344	
14. Safety Systems		0
15. Reactor Cooling System:		42
16. Steam generation system:		23
31. Turbine and auxiliaries:		27
32. Feedwater and Main Steam System:		16
41. Main Generator System:		57
Total	344	165

## DE-27 GROHNDE (KWG)

**Operator:** KWG (Gemeinschaftskernkraftwerk Grohnde GmbH & Co. oHG)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1360.0 MW(e)  
**Design Net Capacity:** 1289.0 MW(e)  
**Design Discharge Burnup:** 40000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 10545.9 GW(e).h  
**Energy Availability Factor:** 91.0%  
**Load Factor:** 88.5%  
**Operating Factor:** 91.9%  
**Energy Unavailability Factor:** 9.0%  
**Total Off-line Time:** 712 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	996.2	948.0	958.3	965.4	279.6	632.6	940.0	938.2	932.6	985.3	964.0	1005.7	10545.9
<b>EAF (%)</b>	100.0	99.9	100.0	100.0	27.8	66.2	99.9	99.9	100.0	99.6	99.9	99.9	91.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	28.9	68.4	99.9	99.9	100.0	99.6	99.9	99.9	91.3
<b>LF (%)</b>	98.5	103.7	94.7	98.7	27.6	64.6	92.9	92.7	95.2	97.2	98.4	99.4	88.5
<b>OF (%)</b>	100.0	103.6	99.9	100.1	29.4	70.7	100.0	100.0	100.0	100.0	100.0	100.0	91.9
<b>EUF (%)</b>	0.0	0.1	0.0	0.0	72.2	33.8	0.1	0.1	0.0	0.4	0.1	0.1	9.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	71.1	17.3	0.0	0.1	0.0	0.0	0.0	0.0	7.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	14.3	0.1	0.0	0.0	0.4	0.1	0.1	1.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	1.1	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Jun 1976  
**Date of First Criticality:** 01 Sep 1984  
**Date of Grid Connection:** 05 Sep 1984  
**Date of Commercial Operation:** 01 Feb 1985

**Lifetime Generation:** 257013.2 GW(e).h  
**Cumulative Energy Availability Factor:** 92.3%  
**Cumulative Load Factor:** 90.8%  
**Cumulative Unit Capability Factor:** 92.4%  
**Cumulative Energy Unavailability Factor:** 7.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	9896.4	1300.0	95.2	95.2	95.2	95.2	95.0	95.0	7662	95.6
1986	10205.4	1300.0	89.7	92.3	89.7	92.3	89.6	92.2	8120	92.7
1987	9648.5	1300.0	86.4	90.3	86.4	90.3	84.7	89.6	7979	91.1
1988	10208.3	1300.0	90.8	90.4	90.8	90.4	89.4	89.6	8104	92.3
1989	10279.4	1300.0	90.3	90.4	90.3	90.4	90.3	89.7	8058	92.0
1990	10123.6	1314.0	88.1	90.0	88.1	90.0	87.9	89.4	7872	89.9
1991	9957.8	1325.0	86.4	89.5	86.4	89.5	85.8	88.9	7603	86.8
1992	10424.3	1325.0	90.0	89.6	90.0	89.6	89.6	89.0	7981	90.9
1993	10680.1	1325.0	92.8	89.9	92.8	89.9	92.0	89.3	8147	93.0
1994	10266.5	1325.0	91.9	90.1	91.9	90.1	88.5	89.2	8063	92.0
1995	10771.2	1349.0	91.1	90.2	91.1	90.2	91.1	89.4	7986	91.2
1996	10589.8	1360.0	88.9	90.1	88.9	90.1	88.6	89.3	7861	89.5
1997	11864.7	1360.0	100.0	90.9	100.0	90.9	99.6	90.1	8760	100.0
1998	11146.3	1360.0	94.5	91.2	94.5	91.2	93.6	90.4	8301	94.8
1999	11212.1	1360.0	95.3	91.4	95.3	91.4	94.1	90.7	8351	95.3
2000	11055.9	1360.0	93.7	91.6	93.7	91.6	92.5	90.8	8250	93.9
2001	10926.6	1360.0	94.7	91.8	94.2	91.7	91.7	90.8	8310	94.9
2002	10791.9	1360.0	93.8	91.9	93.8	91.9	90.6	90.8	8233	94.0
2003	10933.0	1360.0	95.0	92.1	95.0	92.0	91.8	90.9	8343	95.2
2004	10695.4	1360.0	93.6	92.1	93.6	92.1	89.5	90.8	8245	93.9
2005	10840.9	1360.0	95.1	92.3	94.5	92.2	91.0	90.8	8364	95.5
2006	10995.7	1360.0	94.5	92.4	94.2	92.3	92.3	90.9	8296	94.7
2007	10818.4	1360.0	94.1	92.5	93.6	92.4	90.8	90.9	8270	94.4
2008	10545.9	1360.0	91.3	92.4	91.0	92.3	88.5	90.8	8048	91.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		88			51	
C. Inspection, maintenance or repair combined with refuelling	648			470	4	
D. Inspection, maintenance or repair without refuelling				2		
Z. Others					11	
Subtotal	648	88	0	472	66	0
Total		736			538	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	88	0
12. Reactor I&C Systems		4
15. Reactor Cooling System:		10
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		1
35. All other I&C Systems		1
41. Main Generator System:		29
42. Electrical Power Supply System:		4
Total	88	49

## DE-26 GUNDREMMINGEN-B (GUN-B)

Operator: KGG (Kernkraftwerk Gundremmingen GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1284.0 MW(e)  
 Design Net Capacity: 1244.0 MW(e)  
 Design Discharge Burnup: 45000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 9669.9 GW(e).h  
 Energy Availability Factor: 85.1%  
 Load Factor: 86.0%  
 Operating Factor: 86.4%  
 Energy Unavailability Factor: 14.9%  
 Total Off-line Time: 1192 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	708.5	905.4	967.6	915.1	955.2	447.1	47.1	943.5	928.2	964.4	928.8	958.8	9669.9
EAF (%)	73.7	100.0	100.0	98.2	100.0	48.5	5.0	99.0	99.7	100.0	99.1	99.2	85.1
UCF (%)	73.7	100.0	100.0	98.2	100.0	48.5	5.0	99.0	99.7	100.0	99.1	99.2	85.1
LF (%)	74.2	104.9	101.3	99.1	100.0	48.4	4.9	98.8	100.4	100.8	100.5	100.4	86.0
OF (%)	78.2	103.6	99.9	100.1	100.0	48.9	7.8	100.0	100.0	100.0	100.0	100.0	86.4
EUF (%)	26.3	0.0	0.0	1.8	0.0	51.5	95.0	1.0	0.3	0.0	0.9	0.8	14.9
PUF (%)	0.0	0.0	0.0	1.8	0.0	50.7	74.4	1.0	0.3	0.0	0.9	0.2	10.8
UCLF (%)	26.3	0.0	0.0	0.0	0.0	0.8	20.7	0.0	0.0	0.0	0.0	0.5	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. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 20 Jul 1976      Lifetime Generation: 226260.0 GW(e).h  
 Date of First Criticality: 09 Mar 1984      Cumulative Energy Availability Factor: 88.2%  
 Date of Grid Connection: 16 Mar 1984      Cumulative Load Factor: 82.7%  
 Date of Commercial Operation: 19 Jul 1984      Cumulative Unit Capability Factor: 88.4%  
    Cumulative Energy Unavailability Factor: 11.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	4656.0	1250.0	85.3	85.3	85.3	85.3	84.7	84.7	3958	89.6
1985	9147.5	1244.0	85.5	85.4	85.5	85.4	83.9	84.2	7852	89.6
1986	8298.3	1244.0	83.1	84.5	83.1	84.5	76.1	81.0	7434	84.9
1987	8413.2	1240.0	84.4	84.5	84.4	84.5	77.5	80.0	7876	89.9
1988	7079.3	1240.0	83.6	84.3	83.6	84.3	65.0	76.7	7706	87.7
1989	9653.7	1240.0	97.9	86.8	97.9	86.8	88.9	78.9	8743	99.8
1990	8442.3	1240.0	83.6	86.3	83.6	86.3	77.7	78.7	7717	88.1
1991	8002.7	1240.0	77.7	85.1	74.8	84.7	73.7	78.0	7520	85.8
1992	7366.8	1240.0	78.4	84.3	78.4	84.0	67.6	76.8	7073	80.5
1993	8015.8	1240.0	84.9	84.4	84.9	84.1	73.8	76.5	7632	87.1
1994	8825.6	1240.0	92.1	85.1	91.7	84.8	81.2	76.9	8213	93.8
1995	8681.7	1284.0	84.7	85.1	84.7	84.8	77.2	77.0	7535	86.0
1996	9370.9	1284.0	88.6	85.4	88.6	85.1	83.1	77.5	7903	90.0
1997	9206.1	1284.0	92.8	85.9	92.8	85.7	81.8	77.8	8264	94.3
1998	9072.1	1284.0	89.2	86.2	89.2	85.9	80.7	78.0	7996	91.3
1999	9595.4	1284.0	93.3	86.6	93.3	86.4	85.3	78.5	8257	94.3
2000	9336.4	1284.0	88.8	86.8	88.8	86.6	82.8	78.7	7887	89.8
2001	10216.7	1284.0	94.8	87.2	94.8	87.1	90.8	79.5	8405	95.9
2002	9976.9	1284.0	92.1	87.5	92.1	87.3	88.7	80.0	8139	92.9
2003	10480.4	1284.0	94.4	87.9	94.4	87.7	93.2	80.7	8325	95.0
2004	10283.1	1284.0	91.3	88.0	91.3	87.9	91.2	81.2	8208	93.4
2005	10299.9	1284.0	92.3	88.2	91.5	88.1	91.6	81.7	8145	93.0
2006	10085.8	1284.0	90.1	88.3	89.4	88.1	89.7	82.0	7963	90.9
2007	10496.5	1284.0	94.1	88.6	92.9	88.3	93.3	82.5	8299	94.7
2008	9669.9	1284.0	85.1	88.4	85.1	88.2	86.0	82.7	7568	86.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		315			18	
B. Refuelling without a maintenance				6	0	
C. Inspection, maintenance or repair combined with refuelling	893			687	1	
D. Inspection, maintenance or repair without refuelling				12		
E. Testing of plant systems or component:	8			0		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				5		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					5	
Subtotal	901	315	0	710	24	0
Total		1216			734	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		3
13. Reactor Auxiliary System:	3	
14. Safety Systems		0
15. Reactor Cooling System:		1
16. Steam generation system:	150	
31. Turbine and auxiliaries	162	3
32. Feedwater and Main Steam System		8
Total	315	15



**DE-28 GUNDREMMINGEN-C (GUN-C)**

Operator: KGG (Kernkraftwerk Gundremmingen GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

**1. Station Details**

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 1288.0 MW(e)

Design Net Capacity: 1249.0 MW(e)

Design Discharge Burnup: 45000 MW.d/t

Status at end of year: Operational

**2. Production Summary 2008**

Net Energy Production: 9929.0 GW(e).h

Energy Availability Factor: 87.3%

Load Factor: 88.0%

Operating Factor: 88.3%

Energy Unavailability Factor: 12.7%

Total Off-line Time: 1023 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	963.8	912.6	972.0	940.2	941.9	917.5	949.2	942.1	829.7	0.0	588.9	971.1	9929.0
EAF (%)	99.0	100.0	100.0	100.0	97.9	99.7	100.0	99.4	90.4	0.0	62.7	100.0	87.3
UCF (%)	99.0	100.0	100.0	100.0	97.9	99.7	100.0	99.4	92.3	0.0	62.7	100.0	87.5
LF (%)	100.6	105.4	101.4	101.5	98.3	98.9	99.0	98.3	89.5	0.0	63.5	101.3	88.0
OF (%)	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	92.8	0.0	65.3	100.0	88.3
EUF (%)	1.0	0.0	0.0	0.0	2.1	0.3	0.0	0.6	9.6	100.0	37.3	0.0	12.7
PUF (%)	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.5	7.7	100.0	19.3	0.0	10.9
UCLF (%)	1.0	0.0	0.0	0.0	0.1	0.3	0.0	0.1	0.0	0.0	18.0	0.0	1.6
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

**4. 2008 Summary of Operation****5. Historical Summary**

Date of Construction Start: 20 Jul 1976      Lifetime Generation: 216815.1 GW(e).h

Date of First Criticality: 26 Oct 1984      Cumulative Energy Availability Factor: 86.6%

Date of Grid Connection: 02 Nov 1984      Cumulative Load Factor: 80.4%

Date of Commercial Operation: 18 Jan 1985      Cumulative Unit Capability Factor: 86.9%

   Cumulative Energy Unavailability Factor: 13.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	9149.6	1244.0	85.5	85.5	85.5	85.5	84.0	84.0	7663	87.5
1986	8018.5	1244.0	84.7	85.1	84.7	85.1	73.6	78.8	7945	90.7
1987	7333.2	1248.0	74.7	81.6	74.7	81.6	67.1	74.9	7345	83.8
1988	7456.1	1248.0	88.3	83.3	88.3	83.3	68.0	73.1	7887	89.8
1989	7884.5	1248.0	84.2	83.5	84.2	83.5	72.1	72.9	7722	88.2
1990	8264.8	1248.0	80.2	82.9	80.2	82.9	75.6	73.4	7519	85.8
1991	8341.3	1248.0	85.9	83.3	85.9	83.3	76.3	73.8	7709	88.0
1992	9381.0	1248.0	98.9	85.3	98.9	85.3	85.6	75.3	8784	100.0
1993	6689.2	1248.0	79.1	84.6	79.1	84.6	61.2	73.7	7051	80.5
1994	7502.0	1248.0	81.1	84.3	80.7	84.2	68.6	73.2	7147	81.6
1995	9376.7	1288.0	89.3	84.7	89.3	84.7	83.1	74.1	7929	90.5
1996	9509.0	1288.0	91.7	85.3	91.7	85.3	84.0	75.0	8176	93.1
1997	9013.6	1288.0	89.1	85.6	88.7	85.6	79.9	75.4	7861	89.7
1998	9629.5	1288.0	91.5	86.1	91.5	86.0	85.3	76.1	8153	93.1
1999	8187.6	1288.0	77.0	85.4	77.0	85.4	72.6	75.9	6942	79.2
2000	10176.8	1288.0	94.6	86.0	94.6	86.0	90.0	76.8	8375	95.3
2001	9838.4	1288.0	90.7	86.3	87.2	86.0	87.2	77.4	8016	91.5
2002	10335.8	1288.0	93.4	86.7	93.4	86.5	91.6	78.2	8301	94.8
2003	9965.6	1288.0	89.2	86.8	89.2	86.6	88.3	78.7	7931	90.5
2004	8470.5	1288.0	74.9	86.2	74.9	86.0	74.9	78.5	6747	76.8
2005	10015.6	1288.0	92.6	86.5	89.2	86.2	88.8	79.0	8158	93.1
2006	10543.0	1288.0	93.9	86.9	93.7	86.5	93.4	79.7	8289	94.6
2007	9888.3	1288.0	87.4	86.9	87.4	86.6	87.6	80.0	7729	88.2
2008	9929.0	1288.0	87.5	86.9	87.3	86.6	88.0	80.4	7737	88.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		129			179	
B. Refuelling without a maintenance				32	0	
C. Inspection, maintenance or repair combined with refuelling	918			683		
D. Inspection, maintenance or repair without refuelling				21		
E. Testing of plant systems or component:					1	
Subtotal	918	129	0	736	180	0
Total		1047			916	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		8
14. Safety Systems		14
15. Reactor Cooling System:		9
16. Steam generation system:	129	
31. Turbine and auxiliaries		33
32. Feedwater and Main Steam System		0
41. Main Generator System:		113
Total	129	177

## DE-16 ISAR-1 (KKI 1)

**Operator:** E.ON (E.ON Kernkraft GmbH)

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

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 878.0 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 2008

**Net Energy Production:** 7582.6 GW(e).h  
**Energy Availability Factor:** 98.3%  
**Load Factor:** 98.6%  
**Operating Factor:** 100.3%  
**Energy Unavailability Factor:** 1.7%  
**Total Off-line Time:** -24 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	652.4	615.6	656.4	626.3	635.0	617.2	642.5	627.2	615.7	654.1	621.7	618.5	7582.6
<b>EAF (%)</b>	99.1	100.0	100.0	98.9	97.2	97.7	98.4	97.5	97.3	99.9	98.3	95.1	98.3
<b>UCF (%)</b>	99.1	100.0	100.0	98.9	97.7	99.0	100.0	97.5	98.1	100.0	98.9	95.1	98.7
<b>LF (%)</b>	99.9	104.3	100.5	99.2	97.2	97.6	98.4	96.0	97.4	100.0	98.3	94.7	98.6
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.3
<b>EUF (%)</b>	0.9	0.0	0.0	1.1	2.8	2.3	1.6	2.5	2.7	0.1	1.7	4.9	1.7
<b>PUF (%)</b>	0.9	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.3
<b>UCLF (%)</b>	0.0	0.0	0.0	1.1	1.1	1.0	0.0	2.5	1.9	0.0	0.0	4.9	1.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.4	1.3	1.6	0.0	0.8	0.1	0.7	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1972	<b>Lifetime Generation:</b>	183625.9 GW(e).h
<b>Date of First Criticality:</b>	20 Nov 1977	<b>Cumulative Energy Availability Factor:</b>	82.7%
<b>Date of Grid Connection:</b>	03 Dec 1977	<b>Cumulative Load Factor:</b>	79.0%
<b>Date of Commercial Operation:</b>	21 Mar 1979	<b>Cumulative Unit Capability Factor:</b>	83.1%
		<b>Cumulative Energy Unavailability Factor:</b>	17.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	4503.0	870.0	70.5	70.5	70.5	70.5	70.5	70.5	5969	81.3
1980	4202.0	870.0	55.2	62.1	55.2	62.1	55.0	62.0	5791	65.9
1981	4155.9	870.0	53.7	59.2	53.7	59.2	54.5	59.4	5880	67.1
1982	1603.3	870.0	21.1	49.3	21.1	49.3	21.0	49.4	2232	25.5
1983	7143.0	870.0	93.9	58.5	93.9	58.5	93.7	58.6	8627	98.5
1984	5587.0	870.0	73.2	61.0	73.2	61.0	73.1	61.1	7262	82.7
1985	6515.6	870.0	86.0	64.7	86.0	64.7	85.5	64.6	8006	91.4
1986	6370.4	870.0	83.4	67.0	83.4	67.0	83.6	67.0	7871	89.9
1987	7164.7	870.0	93.6	70.1	93.6	70.1	94.0	70.1	8335	95.1
1988	5639.1	870.0	82.3	71.3	82.3	71.3	73.8	70.5	7674	87.4
1989	5205.3	870.0	74.4	71.6	74.4	71.6	68.3	70.3	7233	82.6
1990	5054.8	870.0	74.2	71.8	74.2	71.8	66.3	69.9	7577	86.5
1991	6760.6	870.0	94.9	73.6	94.9	73.6	88.7	71.4	8381	95.7
1992	5872.0	870.0	89.4	74.7	89.4	74.7	76.8	71.8	7903	90.0
1993	5575.2	870.0	85.5	75.5	85.5	75.5	73.2	71.9	7553	86.2
1994	5150.3	870.0	73.5	75.3	73.5	75.3	67.6	71.6	6462	73.8
1995	6446.0	870.0	94.7	76.5	94.7	76.5	84.6	72.4	8306	94.8
1996	5816.3	870.0	86.2	77.0	86.2	77.0	76.1	72.6	7674	87.4
1997	5998.4	870.0	91.5	77.8	91.5	77.8	78.7	72.9	8059	92.0
1998	6335.8	870.0	89.3	78.4	89.2	78.4	83.1	73.4	7857	89.7
1999	7532.1	870.0	98.7	79.4	98.7	79.3	98.8	74.6	8736	99.7
2000	6646.0	874.0	90.8	79.9	90.8	79.9	86.5	75.2	8231	93.7
2001	5889.0	878.0	82.4	80.0	76.2	79.7	76.6	75.3	7353	83.9
2002	7566.2	878.0	98.6	80.8	98.6	80.5	98.4	76.2	8731	99.7
2003	6301.4	878.0	87.4	81.0	87.4	80.8	81.9	76.5	7773	88.7
2004	6771.1	878.0	89.1	81.4	89.1	81.1	87.8	76.9	7984	90.9
2005	7336.9	878.0	96.1	81.9	95.2	81.6	95.4	77.6	8546	97.5
2006	6808.1	878.0	91.4	82.3	89.4	81.9	88.5	78.0	8064	92.1
2007	6755.8	878.0	90.5	82.5	88.6	82.2	87.8	78.3	8086	92.3
2008	7582.6	878.0	98.7	83.1	98.3	82.7	98.6	79.0	8784	100.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					137	
B. Refuelling without a maintenance				6		
C. Inspection, maintenance or repair combined with refuelling				842	3	
D. Inspection, maintenance or repair without refuelling				84		
E. Testing of plant systems or component				93		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				1		
H. Nuclear regulatory requirement					23	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				8	0	0
L. Human factor related					2	
Z. Others					10	
Subtotal	0	0	0	1034	175	0
Total	0			1209		

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		12
15. Reactor Cooling System		27
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries		25
32. Feedwater and Main Steam System		4
41. Main Generator System		17
42. Electrical Power Supply System		28
Total	0	119

## DE-31 ISAR-2 (KKI 2)

Operator: E.ON (E.ON Kernkraft GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1400.0 MW(e)  
 Design Net Capacity: 1285.0 MW(e)  
 Design Discharge Burnup: 60000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 11456.2 GW(e).h  
 Energy Availability Factor: 93.1%  
 Load Factor: 93.4%  
 Operating Factor: 93.8%  
 Energy Unavailability Factor: 6.9%  
 Total Off-line Time: 543 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1058.2	988.3	1053.5	1014.0	1029.2	989.9	340.9	893.2	997.0	1035.7	1009.1	1047.1	11456.2
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	33.7	85.9	100.0	100.0	100.0	99.6	93.1
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	33.7	87.7	100.0	100.0	100.0	100.0	93.3
LF (%)	101.6	105.0	101.1	100.7	98.8	98.2	32.7	85.8	98.9	99.3	100.1	100.5	93.4
OF (%)	100.0	103.6	99.9	100.1	100.0	100.0	34.3	89.5	100.0	100.0	100.0	100.0	93.8
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	66.3	14.1	0.0	0.0	0.0	0.4	6.9
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	50.7	0.0	0.0	0.0	0.0	0.0	4.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	15.6	12.3	0.0	0.0	0.0	0.0	2.4
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.4	0.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 15 Sep 1982      Lifetime Generation: 222070.1 GW(e).h  
 Date of First Criticality: 15 Jan 1988      Cumulative Energy Availability Factor: 91.8%  
 Date of Grid Connection: 22 Jan 1988      Cumulative Load Factor: 88.9%  
 Date of Commercial Operation: 09 Apr 1988      Cumulative Unit Capability Factor: 92.1%  
    Cumulative Energy Unavailability Factor: 8.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	6023.0	1323.0	95.1	95.1	95.1	95.1	69.7	69.7	6177	93.6
1989	7728.9	1310.0	73.4	82.7	73.4	82.7	67.4	68.3	6876	78.5
1990	9271.4	1310.0	84.9	83.5	84.9	83.5	80.8	72.9	7915	90.4
1991	9699.2	1318.0	87.8	84.7	87.8	84.7	84.0	75.8	7732	88.3
1992	9843.5	1320.0	89.9	85.8	89.9	85.8	84.9	77.8	7917	90.1
1993	10193.0	1330.0	91.3	86.7	88.1	86.2	87.5	79.5	8052	91.9
1994	10499.9	1330.0	93.1	87.7	93.1	87.2	90.1	81.1	8209	93.7
1995	10040.3	1332.0	89.8	88.0	89.8	87.6	86.0	81.7	7891	90.1
1996	10265.1	1338.0	90.7	88.3	88.5	87.7	87.3	82.3	7989	90.9
1997	10906.4	1365.0	94.1	88.9	94.1	88.4	91.2	83.3	8258	94.3
1998	10758.1	1365.0	93.6	89.4	93.6	88.9	90.0	83.9	8356	95.4
1999	11610.9	1380.0	96.5	90.0	96.5	89.5	96.0	85.0	8465	96.6
2000	11291.1	1400.0	94.5	90.4	94.5	89.9	91.8	85.5	8311	94.6
2001	11731.3	1400.0	97.1	90.9	97.1	90.5	95.7	86.3	8506	97.1
2002	11512.2	1400.0	95.1	91.2	95.1	90.8	93.9	86.8	8350	95.3
2003	11671.6	1400.0	96.7	91.5	95.9	91.1	95.2	87.4	8491	96.9
2004	11595.3	1400.0	95.4	91.8	95.4	91.4	94.3	87.8	8395	95.6
2005	11102.6	1400.0	90.9	91.7	90.5	91.4	90.5	88.0	7976	91.1
2006	11755.3	1400.0	96.8	92.0	96.6	91.6	95.9	88.4	8494	97.0
2007	11377.5	1400.0	93.4	92.1	93.1	91.7	92.8	88.6	8200	93.6
2008	11456.2	1400.0	93.3	92.1	93.1	91.8	93.4	88.9	8217	93.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		194			63	
B. Refuelling without a maintenance				16		
C. Inspection, maintenance or repair combined with refuelling	373			487	10	
D. Inspection, maintenance or repair without refuelling				0		
E. Testing of plant systems or component				0	1	
L. Human factor related					5	
Z. Others					1	
Subtotal	373	194	0	503	80	0
Total		567			583	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	180	
15. Reactor Cooling System		15
31. Turbine and auxiliaries	2	5
32. Feedwater and Main Steam System		0
41. Main Generator System	12	43
Total	194	63

## DE-20 KRUEMMEL (KKK)

Operator: KKK (Kernkraftwerk Krümmel GmbH &amp; Co. oHG)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1346.0 MW(e)  
 Design Net Capacity: 1260.0 MW(e)  
 Design Discharge Burnup: 32000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: -0.3%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.3%  
 Total Off-line Time: 8760 hours

### 3. 2008 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	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
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	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.3
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.3
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. 2008 Summary of Operation

KRUEMMEL WAS SHUTDOWN FOR THE WHOLE YEAR BECAUSE AUSTENETIC VALVES HAD TO INSPECT AND TO SERVICE

### 5. Historical Summary

Date of Construction Start: 05 Apr 1974      Lifetime Generation: 201377.1 GW(e).h  
 Date of First Criticality: 14 Sep 1983      Cumulative Energy Availability Factor: 75.3%  
 Date of Grid Connection: 28 Sep 1983      Cumulative Load Factor: 72.3%  
 Date of Commercial Operation: 28 Mar 1984      Cumulative Unit Capability Factor: 75.7%  
    Cumulative Energy Unavailability Factor: 24.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	8569.0	1260.0	92.0	92.0	92.0	92.0	92.6	92.6	6984	95.1
1985	9301.9	1260.0	86.2	88.8	84.5	87.9	84.3	88.1	7551	86.2
1986	9488.3	1260.0	87.0	88.2	87.0	87.6	86.0	87.3	7780	88.8
1987	9180.2	1260.0	87.9	88.1	87.9	87.7	83.2	86.2	7822	89.3
1988	9219.2	1260.0	90.1	88.5	90.1	88.2	83.3	85.6	8018	91.3
1989	8241.6	1260.0	78.5	86.8	78.5	86.5	74.7	83.8	7247	82.7
1990	8830.2	1260.0	84.5	86.5	84.5	86.2	80.0	83.2	7507	85.7
1991	7737.6	1260.0	80.0	85.6	80.0	85.4	70.1	81.5	6946	79.3
1992	8325.0	1260.0	83.2	85.4	83.2	85.2	75.2	80.8	7188	81.8
1993	6558.5	1260.0	61.3	82.9	61.3	82.8	59.4	78.6	5399	61.6
1994	2479.8	1260.0	25.1	77.6	25.1	77.4	22.5	73.5	2091	23.9
1995	9217.9	1260.0	88.2	78.5	88.2	78.3	83.5	74.3	7824	89.3
1996	8242.3	1260.0	83.9	78.9	83.9	78.8	74.5	74.3	6868	78.2
1997	9250.6	1260.0	87.3	79.5	85.1	79.2	83.8	75.0	7492	85.5
1998	4611.1	1260.0	46.1	77.3	44.0	76.9	41.8	72.8	3878	44.3
1999	10517.1	1260.0	99.4	78.7	99.4	78.3	95.3	74.2	8760	100.0
2000	9022.9	1260.0	90.2	79.3	90.2	79.0	81.5	74.6	7975	90.8
2001	8141.9	1260.0	76.7	79.2	76.2	78.8	73.8	74.6	6591	75.2
2002	8483.9	1260.0	78.0	79.1	78.0	78.8	76.9	74.7	7069	80.7
2003	9488.5	1260.0	88.2	79.6	88.2	79.3	86.0	75.3	7809	89.1
2004	9626.7	1260.0	87.7	80.0	87.7	79.7	87.0	75.8	7825	89.1
2005	9243.4	1260.0	82.8	80.1	82.4	79.8	83.7	76.2	7328	83.7
2006	10177.8	1260.0	90.6	80.6	88.6	80.2	92.2	76.9	7941	90.7
2007	5454.9	1346.0	47.0	79.1	46.5	78.7	46.3	75.5	4151	47.4



2008	0.0	1346.0	-0.3	75.7	-0.3	75.3	0.0	72.3	0	0.0
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## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		8784			569	
C. Inspection, maintenance or repair combined with refuelling				972	21	
D. Inspection, maintenance or repair without refuelling				26		
E. Testing of plant systems or component				8	1	
H. Nuclear regulatory requirement					7	15
J. Grid limitation, failure or grid unavailability						7
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	
L. Human factor related					0	
P. Fire					23	
Z. Others					17	
Subtotal	0	8784	0	1006	638	22
Total		8784			1666	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		0
14. Safety Systems		1
15. Reactor Cooling System		1
21. Fuel Handling and Storage Facilities		21
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System	8784	402
41. Main Generator System		17
42. Electrical Power Supply System		120
XX. Miscellaneous Systems		4
Total	8784	566

## DE-15 NECKARWESTHEIM-1 (GKN 1)

**Operator:** EnKK (EnBW Kernkraft GmbH)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 785.0 MW(e)  
**Design Net Capacity:** 805.0 MW(e)  
**Design Discharge Burnup:** 36700 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 3787.0 GW(e).h  
**Energy Availability Factor:** 77.5%  
**Load Factor:** 55.1%  
**Operating Factor:** 79.8%  
**Energy Unavailability Factor:** 22.5%  
**Total Off-line Time:** 1770 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	383.8	376.9	379.3	395.8	186.8	366.9	473.6	408.9	365.8	132.0	0.0	317.1	3787.0
<b>EAF (%)</b>	100.0	100.0	99.5	97.1	41.9	83.0	100.0	100.0	94.6	31.6	0.0	83.4	77.5
<b>UCF (%)</b>	100.0	100.0	99.5	97.1	41.9	83.0	100.0	100.0	100.0	32.4	0.0	83.4	78.0
<b>LF (%)</b>	65.7	71.4	64.9	70.1	32.0	64.9	81.1	70.0	64.7	22.6	0.0	54.3	55.1
<b>OF (%)</b>	100.0	103.6	99.9	97.5	43.0	83.1	100.0	100.0	100.0	32.9	0.0	98.8	79.8
<b>EUF (%)</b>	0.0	0.0	0.5	2.9	58.1	17.0	0.0	0.0	5.4	68.4	100.0	16.6	22.5
<b>PUF (%)</b>	0.0	0.0	0.0	2.9	26.5	0.0	0.0	0.0	0.0	67.6	95.5	6.3	16.6
<b>UCLF (%)</b>	0.0	0.0	0.5	0.0	31.7	17.0	0.0	0.0	0.0	0.0	4.5	10.3	5.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	0.9	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

OPERATION ON REDUCED POWER FOR OPTIMIZATION OF CONDITIONING MODE IN THE CONTEXT OF RESOURCE SCHEDULING OF NUCLEAR POWER PLANT.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Feb 1972	<b>Lifetime Generation:</b>	179175.2 GW(e).h
<b>Date of First Criticality:</b>	26 May 1976	<b>Cumulative Energy Availability Factor:</b>	82.9%
<b>Date of Grid Connection:</b>	03 Jun 1976	<b>Cumulative Load Factor:</b>	79.5%
<b>Date of Commercial Operation:</b>	01 Dec 1976	<b>Cumulative Unit Capability Factor:</b>	83.0%
		<b>Cumulative Energy Unavailability Factor:</b>	17.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976	508.6	788.0	89.3	89.3	89.3	89.3	86.4	86.4	658	88.4
1977	4946.6	810.0	70.6	72.0	70.6	72.0	69.7	71.0	6513	74.3
1978	4934.5	810.0	70.2	71.1	70.2	71.1	69.5	70.3	6583	75.1
1979	3573.0	810.0	53.6	65.5	53.6	65.5	50.4	63.8	4698	53.6
1980	5473.0	810.0	77.8	68.5	77.8	68.5	76.9	67.0	7080	80.6
1981	5949.3	810.0	84.9	71.7	84.9	71.7	83.8	70.3	7705	88.0
1982	5781.1	810.0	82.4	73.5	82.4	73.5	81.5	72.2	7517	85.8
1983	6047.0	810.0	85.3	75.1	85.3	75.1	85.2	74.0	7910	90.3
1984	5842.0	795.0	83.1	76.1	83.1	76.1	83.7	75.2	7618	86.7
1985	6161.4	795.0	88.8	77.5	88.8	77.5	88.5	76.6	8050	91.9
1986	4153.1	795.0	59.6	75.7	59.6	75.7	59.6	75.0	5368	61.3
1987	5395.1	795.0	76.8	75.8	76.8	75.8	77.5	75.2	6828	77.9
1988	5269.4	795.0	75.5	75.8	75.5	75.8	75.5	75.2	6772	77.1
1989	4019.5	795.0	64.2	74.9	64.2	74.9	57.7	73.9	6395	73.0
1990	5754.1	785.0	82.8	75.5	82.8	75.5	83.7	74.6	7524	85.9
1991	5404.5	785.0	85.0	76.1	85.0	76.1	78.6	74.8	7614	86.9
1992	5270.1	785.0	83.6	76.6	83.6	76.6	76.4	74.9	7470	85.0
1993	5559.5	785.0	81.6	76.8	81.6	76.8	80.8	75.3	7371	84.1
1994	6307.8	785.0	92.0	77.7	92.0	77.7	91.7	76.2	8184	93.4
1995	5966.0	785.0	87.4	78.2	87.4	78.2	86.8	76.7	8020	91.6
1996	6054.5	785.0	92.0	78.9	92.0	78.9	87.8	77.3	8301	94.5
1997	6230.2	785.0	92.6	79.5	92.6	79.5	90.6	77.9	8305	94.8
1998	5907.8	785.0	91.3	80.0	91.1	80.0	85.9	78.2	8185	93.4
1999	5849.1	785.0	90.0	80.4	90.0	80.4	85.1	78.5	8022	91.6
2000	6141.4	785.0	94.2	81.0	94.2	81.0	89.1	79.0	8284	94.3
2001	5991.5	785.0	90.0	81.4	88.1	81.3	87.1	79.3	8038	91.8
2002	6238.3	785.0	92.7	81.8	92.7	81.7	90.7	79.7	8239	94.1
2003	6024.0	785.0	90.5	82.1	90.5	82.0	87.6	80.0	8304	94.8
2004	5928.5	785.0	89.7	82.4	89.7	82.3	86.0	80.2	8270	94.1
2005	5882.7	785.0	86.9	82.5	86.9	82.5	85.5	80.4	8069	92.1
2006	6182.2	785.0	93.5	82.9	93.1	82.8	89.9	80.7	8250	94.2
2007	4713.5	785.0	92.4	83.2	92.2	83.1	68.5	80.3	8153	93.1
2008	3787.0	785.0	78.0	83.0	77.5	82.9	55.1	79.5	6990	79.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		357			35	
C. Inspection, maintenance or repair combined with refuelling	1187			1067		
D. Inspection, maintenance or repair without refuelling				20		
E. Testing of plant systems or component:					46	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						1
L. Human factor related		41				
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)	209					
Subtotal	1396	398	0	1087	81	1
Total		1794			1169	

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	357	
14. Safety Systems		1
15. Reactor Cooling System:		18
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		7
41. Main Generator System:		3
42. Electrical Power Supply System:		0
Total	357	33

## DE-44 NECKARWESTHEIM-2 (GKN 2)

Operator: EnKK (EnBW Kernkraft GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1310.0 MW(e)  
 Design Net Capacity: 1225.0 MW(e)  
 Design Discharge Burnup: 36800 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 10701.9 GW(e).h  
 Energy Availability Factor: 93.2%  
 Load Factor: 93.3%  
 Operating Factor: 94.1%  
 Energy Unavailability Factor: 6.8%  
 Total Off-line Time: 515 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	975.9	913.0	975.2	942.0	963.3	926.6	956.4	667.5	498.1	967.1	939.3	977.7	10701.9
EAF (%)	100.0	99.9	100.0	100.0	99.9	100.0	100.0	66.1	53.2	100.0	100.0	99.9	93.2
UCF (%)	100.0	99.9	100.0	100.0	99.9	100.0	100.0	68.5	53.2	100.0	100.0	99.9	93.5
LF (%)	100.1	103.7	100.1	100.0	98.8	98.2	98.1	68.5	52.8	99.1	99.6	100.3	93.3
OF (%)	100.0	103.6	99.9	100.1	100.0	100.0	100.0	71.6	54.4	100.0	100.0	100.0	94.1
EUF (%)	0.0	0.1	0.0	0.0	0.1	0.0	0.0	33.9	46.8	0.0	0.0	0.1	6.8
PUF (%)	0.0	0.1	0.0	0.0	0.1	0.0	0.0	31.5	23.3	0.0	0.0	0.1	4.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.5	0.0	0.0	0.0	1.9
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 09 Nov 1982  
 Date of First Criticality: 29 Dec 1988  
 Date of Grid Connection: 03 Jan 1989  
 Date of Commercial Operation: 15 Apr 1989

Lifetime Generation: 205217.4 GW(e).h  
 Cumulative Energy Availability Factor: 93.4%  
 Cumulative Load Factor: 92.4%  
 Cumulative Unit Capability Factor: 93.6%  
 Cumulative Energy Unavailability Factor: 6.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	6810.0	1225.0	99.8	99.8	99.8	99.8	84.2	84.2	6254	94.7
1990	9693.9	1225.0	90.2	94.3	90.2	94.3	90.3	87.7	7958	90.8
1991	9434.9	1225.0	90.5	92.9	90.5	92.9	87.9	87.8	7932	90.5
1992	10204.6	1269.0	91.6	92.6	91.6	92.6	91.5	88.8	8094	92.1
1993	9912.2	1269.0	89.0	91.8	89.0	91.8	89.2	88.9	8163	93.2
1994	10320.7	1269.0	93.6	92.1	93.6	92.1	92.8	89.6	8215	93.8
1995	10532.0	1269.0	94.7	92.5	94.7	92.5	94.7	90.4	8351	95.3
1996	10614.3	1269.0	95.1	92.8	95.1	92.8	95.2	91.0	8419	95.8
1997	10111.6	1269.0	91.5	92.7	91.5	92.7	91.0	91.0	8028	91.6
1998	10610.8	1269.0	96.0	93.0	96.0	93.0	95.5	91.5	8411	96.0
1999	10460.9	1269.0	96.1	93.3	96.1	93.3	94.1	91.7	8435	96.3
2000	10473.9	1269.0	96.2	93.6	96.2	93.6	94.0	91.9	8450	96.2
2001	10423.9	1269.0	95.4	93.7	94.2	93.6	93.8	92.0	8363	95.5
2002	9787.5	1269.0	88.7	93.3	88.7	93.3	88.0	91.8	7777	88.8
2003	10545.0	1269.0	95.8	93.5	95.8	93.4	94.9	92.0	8408	96.0
2004	10470.7	1269.0	92.9	93.5	92.9	93.4	93.9	92.1	8165	93.0
2005	10836.4	1305.0	95.4	93.6	94.8	93.5	94.8	92.3	8371	95.6
2006	10877.5	1305.0	95.9	93.7	95.4	93.6	95.2	92.4	8405	95.9
2007	10411.1	1310.0	91.1	93.6	91.1	93.5	90.7	92.3	8002	91.3
2008	10701.9	1310.0	93.5	93.6	93.2	93.4	93.3	92.4	8245	94.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					13	
C. Inspection, maintenance or repair combined with refuelling	370			477		
L. Human factor related		169				
Subtotal	370	169	0	477	13	0
Total	539			490		

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		12
32. Feedwater and Main Steam System		0
41. Main Generator System		0
Total	0	12

## DE-14 PHILIPPSBURG-1 (KKP 1)

**Operator:** EnKK (EnBW Kernkraft GmbH)

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

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 890.0 MW(e)  
**Design Net Capacity:** 864.0 MW(e)  
**Design Discharge Burnup:** 39900 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 6126.6 GW(e).h  
**Energy Availability Factor:** 80.2%  
**Load Factor:** 78.6%  
**Operating Factor:** 83.5%  
**Energy Unavailability Factor:** 19.8%  
**Total Off-line Time:** 1442 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	652.9	606.1	609.5	195.7	0.0	416.8	642.3	641.8	629.4	639.7	639.7	452.8	6126.6
<b>EAF (%)</b>	98.8	98.0	92.4	31.0	0.0	65.6	97.2	97.1	98.4	96.6	99.7	87.7	80.2
<b>UCF (%)</b>	99.5	100.0	99.8	36.7	0.0	68.8	100.0	99.6	100.0	97.6	100.0	88.4	82.5
<b>LF (%)</b>	98.6	101.3	92.0	30.6	0.0	65.0	97.0	96.9	98.2	96.5	99.8	68.4	78.6
<b>OF (%)</b>	100.0	103.6	99.9	37.3	0.0	74.0	100.0	100.0	100.0	98.5	100.0	90.3	83.5
<b>EUF (%)</b>	1.2	2.0	7.6	69.0	100.0	34.4	2.8	2.9	1.6	3.4	0.3	12.3	19.8
<b>PUF (%)</b>	0.5	0.0	0.0	63.3	91.3	0.0	0.0	0.4	0.0	0.0	0.0	0.0	13.0
<b>UCLF (%)</b>	0.0	0.0	0.2	0.0	8.7	31.2	0.0	0.0	0.0	2.4	0.0	11.6	4.5
<b>XUF (%)</b>	0.7	2.0	7.4	5.7	0.0	3.2	2.8	2.5	1.6	1.0	0.3	0.6	2.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Oct 1970	<b>Lifetime Generation:</b>	173061.8 GW(e).h
<b>Date of First Criticality:</b>	09 Mar 1979	<b>Cumulative Energy Availability Factor:</b>	79.4%
<b>Date of Grid Connection:</b>	05 May 1979	<b>Cumulative Load Factor:</b>	77.3%
<b>Date of Commercial Operation:</b>	26 Mar 1980	<b>Cumulative Unit Capability Factor:</b>	79.6%
		<b>Cumulative Energy Unavailability Factor:</b>	20.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	1205.0	864.0	19.2	19.2	19.2	19.2	19.0	19.0	1562	21.3
1981	1090.9	864.0	16.6	17.8	16.6	17.8	14.4	16.5	1465	16.7
1982	5034.4	840.0	66.5	34.6	66.5	34.6	68.4	34.5	6237	71.2
1983	5503.0	864.0	72.7	44.6	72.7	44.6	72.7	44.5	6567	75.0
1984	6325.0	864.0	83.2	52.7	83.2	52.7	83.3	52.6	7482	85.2
1985	6120.2	864.0	81.1	57.6	81.1	57.6	80.9	57.5	7561	86.3
1986	5222.0	864.0	69.1	59.3	69.1	59.3	69.0	59.1	6148	70.2
1987	6488.4	864.0	84.9	62.5	84.9	62.5	85.7	62.5	7582	86.6
1988	6199.6	864.0	83.7	64.9	83.7	64.9	81.7	64.7	7302	83.1
1989	6158.9	864.0	81.4	66.6	81.4	66.6	81.4	66.4	7432	84.8
1990	5203.1	864.0	68.3	66.8	68.3	66.8	68.7	66.6	6138	70.1
1991	6171.9	864.0	82.9	68.1	82.9	68.1	81.5	67.9	7304	83.4
1992	6513.0	864.0	86.6	69.6	86.6	69.6	85.8	69.3	7647	87.1
1993	4614.5	864.0	74.7	69.9	74.7	69.9	61.0	68.7	6599	75.3
1994	6565.9	864.0	86.5	71.1	86.5	71.1	86.8	69.9	7645	87.3
1995	6317.1	876.0	86.9	72.1	86.9	72.1	82.3	70.7	7671	87.6
1996	6929.8	864.0	91.1	73.2	91.1	73.2	91.3	71.9	8087	92.1
1997	6409.5	876.0	85.3	73.9	85.3	73.9	83.5	72.6	7510	85.7
1998	6905.9	890.0	93.9	75.0	93.9	75.0	88.6	73.5	8253	94.2
1999	6892.9	890.0	94.3	76.0	94.3	76.0	88.4	74.2	8292	94.7
2000	6904.9	890.0	92.9	76.8	92.9	76.8	88.3	74.9	8187	93.2
2001	6956.9	890.0	92.7	77.6	92.7	77.6	89.2	75.6	8206	93.7
2002	6559.4	890.0	89.4	78.1	89.4	78.1	84.1	76.0	7885	90.0
2003	6395.2	890.0	86.0	78.4	86.0	78.4	82.0	76.2	7629	87.1
2004	6332.0	890.0	83.5	78.6	83.5	78.6	81.0	76.4	7425	84.5
2005	5811.8	890.0	77.5	78.6	75.8	78.5	74.5	76.4	6835	78.0
2006	6888.8	890.0	90.3	79.0	90.3	79.0	88.4	76.8	7983	91.1
2007	6944.9	890.0	92.0	79.5	90.0	79.4	89.1	77.3	8124	92.7
2008	6126.6	890.0	82.5	79.6	80.2	79.4	78.6	77.3	7318	83.5



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		335			140	
B. Refuelling without a maintenance outage					0	
C. Inspection, maintenance or repair combined with refuelling	1131			953	2	
D. Inspection, maintenance or repair without refuelling				18		
E. Testing of plant systems or component					6	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					5	
Z. Others					6	
Subtotal	1131	335	0	971	159	0
Total		1466			1130	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		4
13. Reactor Auxiliary System:		3
14. Safety Systems	137	9
15. Reactor Cooling System:		44
16. Steam generation system:	115	
31. Turbine and auxiliaries	72	20
32. Feedwater and Main Steam System	11	23
33. Circulating Water System		1
41. Main Generator System:		10
42. Electrical Power Supply System:		0
XX. Miscellaneous Systems		14
Total	335	130

## DE-24 PHILIPPSBURG-2 (KKP 2)

Operator: EnKK (EnBW Kernkraft GmbH)

Contractor: KWU (SIEMENS KRAFTWERK UNION AG)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1392.0 MW(e)  
 Design Net Capacity: 1268.0 MW(e)  
 Design Discharge Burnup: 40000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 10840.8 GW(e).h  
 Energy Availability Factor: 88.7%  
 Load Factor: 88.9%  
 Operating Factor: 90.8%  
 Energy Unavailability Factor: 11.3%  
 Total Off-line Time: 807 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1025.9	956.5	1019.0	990.4	1008.4	832.3	0.0	970.9	989.7	1023.0	995.5	1029.2	10840.8
EAF (%)	99.1	98.7	98.5	98.8	97.4	83.2	0.0	93.8	98.7	98.7	99.3	99.4	88.7
UCF (%)	100.0	100.0	99.7	100.0	100.0	88.8	0.0	96.9	100.0	100.0	100.0	100.0	90.3
LF (%)	99.1	102.3	98.4	99.0	97.4	83.0	0.0	93.7	98.8	98.6	99.3	99.4	88.9
OF (%)	100.0	103.6	99.9	100.1	100.0	90.6	0.0	97.4	100.0	100.0	100.0	100.0	90.8
EUF (%)	0.9	1.3	1.5	1.2	2.6	16.8	100.0	6.2	1.3	1.3	0.7	0.6	11.3
PUF (%)	0.0	0.0	0.0	0.0	0.0	9.9	100.0	3.1	0.0	0.1	0.0	0.0	9.6
UCLF (%)	0.0	0.0	0.2	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1
XUF (%)	0.9	1.3	1.2	1.2	2.6	5.6	0.0	3.1	1.2	1.3	0.7	0.6	1.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 07 Jul 1977      Lifetime Generation: 247448.1 GW(e).h  
 Date of First Criticality: 13 Dec 1984      Cumulative Energy Availability Factor: 89.2%  
 Date of Grid Connection: 17 Dec 1984      Cumulative Load Factor: 88.4%  
 Date of Commercial Operation: 18 Apr 1985      Cumulative Unit Capability Factor: 90.4%  
    Cumulative Energy Unavailability Factor: 10.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	7930.0	1268.0	95.0	95.0	95.0	95.0	94.7	94.7	6411	97.1
1986	10235.3	1268.0	90.6	92.5	90.6	92.5	92.1	93.3	7958	90.8
1987	9616.2	1268.0	85.0	89.8	85.0	89.8	86.6	90.8	7446	85.0
1988	9710.8	1268.0	86.5	88.9	86.5	88.9	87.2	89.9	7656	87.2
1989	9677.3	1268.0	86.2	88.3	86.2	88.3	87.1	89.3	7575	86.5
1990	8516.3	1268.0	75.5	86.1	75.5	86.1	76.7	87.1	6628	75.7
1991	9903.3	1268.0	88.4	86.4	88.0	86.4	89.1	87.4	7757	88.6
1992	9400.0	1285.0	82.2	85.9	82.2	85.8	83.3	86.9	7273	82.8
1993	10481.3	1324.0	90.5	86.4	90.5	86.4	90.4	87.3	7946	90.7
1994	10284.8	1336.0	88.7	86.7	88.7	86.6	87.9	87.3	7778	88.8
1995	10550.5	1336.0	91.0	87.1	91.0	87.0	90.1	87.6	7990	91.2
1996	11217.6	1358.0	94.7	87.8	94.7	87.7	94.0	88.2	8323	94.8
1997	11113.5	1358.0	95.3	88.4	95.3	88.4	93.4	88.6	8358	95.4
1998	10731.5	1358.0	93.0	88.7	93.0	88.7	90.2	88.7	8304	94.8
1999	11122.9	1358.0	96.1	89.3	96.1	89.2	93.5	89.1	8431	96.2
2000	10689.1	1363.0	92.2	89.5	92.2	89.4	89.2	89.1	8115	92.4
2001	8995.8	1392.0	96.0	89.9	76.6	88.6	73.8	88.1	6749	77.0
2002	11053.2	1392.0	92.4	90.0	92.4	88.8	90.6	88.3	8138	92.9
2003	11010.2	1392.0	93.5	90.2	93.5	89.1	90.3	88.4	8234	94.0
2004	10295.0	1392.0	86.9	90.0	86.9	89.0	84.2	88.2	7641	87.0
2005	10823.4	1392.0	92.3	90.2	89.3	89.0	88.8	88.2	8099	92.5
2006	10956.2	1392.0	92.8	90.3	91.2	89.1	89.8	88.3	8138	92.9
2007	11172.9	1392.0	94.1	90.5	92.1	89.2	91.6	88.4	8254	94.2
2008	10840.8	1392.0	90.3	90.4	88.7	89.2	88.9	88.4	7953	90.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 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	832			640	5	
D. Inspection, maintenance or repair without refuelling				47		
E. Testing of plant systems or component:				0		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						69
Z. Others					17	
Subtotal	832	0	0	687	100	69
Total	832			856		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		5
15. Reactor Cooling System:		52
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		0
41. Main Generator System:		12
42. Electrical Power Supply System:		6
Total	0	76

## DE-17 UNTERWESER (KKU)

**Operator:** E.ON (E.ON Kernkraft GmbH)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1345.0 MW(e)  
**Design Net Capacity:** 1230.0 MW(e)  
**Design Discharge Burnup:** 35400 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 9295.5 GW(e).h  
**Energy Availability Factor:** 79.5%  
**Load Factor:** 78.9%  
**Operating Factor:** 87.5%  
**Energy Unavailability Factor:** 20.5%  
**Total Off-line Time:** 1097 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	998.8	933.0	981.7	968.8	969.9	845.5	835.0	517.2	135.1	352.6	746.9	1011.2	9295.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	99.9	90.1	86.4	53.0	13.9	35.2	76.0	100.0	79.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	99.8	69.0	14.0	35.2	76.0	100.0	82.8
<b>LF (%)</b>	99.8	103.2	98.1	100.2	96.9	87.3	83.4	51.7	13.9	35.2	77.1	101.0	78.9
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	71.2	27.4	71.0	76.7	100.0	87.5
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.1	9.9	13.6	47.0	86.1	64.8	24.0	0.0	20.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0	70.3	0.0	0.0	0.0	8.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.0	15.8	64.8	24.0	0.0	9.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.1	9.9	13.4	16.0	0.0	0.0	0.0	0.0	3.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jul 1972	<b>Lifetime Generation:</b>	266650.8 GW(e).h
<b>Date of First Criticality:</b>	16 Sep 1978	<b>Cumulative Energy Availability Factor:</b>	82.0%
<b>Date of Grid Connection:</b>	29 Sep 1978	<b>Cumulative Load Factor:</b>	79.7%
<b>Date of Commercial Operation:</b>	06 Sep 1979	<b>Cumulative Unit Capability Factor:</b>	82.6%
		<b>Cumulative Energy Unavailability Factor:</b>	18.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	3338.0	1230.0	92.1	92.1	92.1	92.1	92.7	92.7	2731	93.3
1980	9272.0	1230.0	85.8	87.3	85.8	87.3	85.8	87.5	7832	89.2
1981	9023.5	1230.0	83.5	85.7	83.5	85.7	83.7	85.9	7606	86.8
1982	9114.2	1230.0	84.7	85.4	84.7	85.4	84.6	85.5	8022	91.6
1983	8215.0	1230.0	75.8	83.2	75.8	83.2	76.2	83.4	7191	82.1
1984	9483.0	1230.0	87.2	83.9	87.2	83.9	87.8	84.2	7908	90.0
1985	9931.8	1230.0	93.4	85.4	93.4	85.4	92.2	85.5	8279	94.5
1986	7280.8	1230.0	67.4	83.0	67.4	83.0	67.6	83.0	6254	71.4
1987	8673.9	1230.0	80.7	82.7	80.7	82.7	80.5	82.7	7277	83.1
1988	9108.4	1230.0	84.9	82.9	84.9	82.9	84.3	82.9	7627	86.8
1989	9245.6	1230.0	89.3	83.6	89.3	83.6	85.8	83.2	7873	89.9
1990	8485.0	1230.0	78.9	83.2	78.9	83.2	78.7	82.8	6921	79.0
1991	6485.9	1231.0	61.1	81.4	61.1	81.4	60.1	80.9	5369	61.3
1992	8731.5	1230.0	86.5	81.7	86.5	81.7	80.8	80.9	7646	87.0
1993	10824.8	1255.0	99.9	83.0	99.9	83.0	98.5	82.2	8760	100.0
1994	7685.9	1255.0	80.1	82.8	80.1	82.8	69.9	81.4	7039	80.4
1995	7980.6	1255.0	77.5	82.5	77.5	82.5	72.6	80.8	6832	78.0
1996	9907.7	1285.0	91.3	83.0	91.3	83.0	87.8	81.2	8055	91.7
1997	9932.4	1285.0	94.4	83.7	94.4	83.7	88.2	81.6	8291	94.6
1998	6618.0	1285.0	58.7	82.3	58.7	82.3	58.8	80.4	5217	59.6
1999	8096.6	1285.0	78.3	82.1	78.3	82.1	71.9	80.0	6899	78.8
2000	9615.8	1295.0	86.2	82.3	86.2	82.3	84.5	80.2	7604	86.6
2001	10656.7	1345.0	95.2	83.0	90.8	82.7	90.4	80.7	8378	95.6
2002	6774.8	1345.0	60.5	81.9	60.5	81.7	57.5	79.6	5313	60.7
2003	9254.9	1345.0	88.3	82.2	88.3	82.0	78.5	79.6	7882	90.0
2004	9724.0	1345.0	87.4	82.4	87.4	82.2	82.3	79.7	7711	87.8
2005	8890.6	1345.0	76.7	82.2	75.9	82.0	75.5	79.5	6742	77.0
2006	10391.5	1345.0	94.7	82.7	88.6	82.2	88.2	79.9	8315	94.9
2007	9076.3	1345.0	79.3	82.6	77.3	82.1	77.0	79.8	6984	79.7
2008	9295.5	1345.0	82.8	82.6	79.5	82.0	78.9	79.7	7663	87.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		384			268	
B. Refuelling without a maintenance outage					11	
C. Inspection, maintenance or repair combined with refuelling	720			835	85	
D. Inspection, maintenance or repair without refuelling				28		
E. Testing of plant systems or component				28		
H. Nuclear regulatory requirement				0	25	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					17	
L. Human factor related		17			10	
Subtotal	720	401	0	891	416	0
Total		1121			1307	

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		31
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		21
15. Reactor Cooling Systems		14
31. Turbine and auxiliaries		52
32. Feedwater and Main Steam System		9
33. Circulating Water System		0
41. Main Generator Systems		129
42. Electrical Power Supply Systems	384	1
XX. Miscellaneous Systems		0
Total	384	263

# HU-1 PAKS-1

Operator: PAKS Zrt (PAKS NUCLEAR POWER PLANT LTD)

Contractor: AEE (ATOMENERGOEXPORT)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 3670.3 GW(e).h  
 Energy Availability Factor: 88.9%  
 Load Factor: 89.1%  
 Operating Factor: 89.3%  
 Energy Unavailability Factor: 11.1%  
 Total Off-line Time: 936 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	349.3	327.1	315.4	6.5	346.1	338.4	349.7	349.7	338.4	350.0	251.0	348.7	3670.3
EAF (%)	99.9	100.0	90.3	1.8	99.0	100.0	100.0	100.0	100.0	100.0	74.2	100.0	88.9
UCF (%)	100.0	100.0	90.3	1.8	99.0	100.0	100.0	100.0	100.0	100.0	74.2	100.0	88.9
LF (%)	99.9	103.6	90.2	1.9	99.0	100.0	100.0	100.0	100.0	100.0	74.2	99.7	89.1
OF (%)	100.0	103.6	90.2	2.5	100.0	100.0	100.0	100.0	100.0	100.0	74.2	100.0	89.3
EUUF (%)	0.1	0.0	9.7	98.2	1.0	0.0	0.0	0.0	0.0	0.0	25.8	0.0	11.1
PUF (%)	0.0	0.0	9.7	93.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.5
UCLF (%)	0.1	0.0	0.0	4.8	1.0	0.0	0.0	0.0	0.0	0.0	25.8	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. 2008 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE

## 5. Historical Summary

Date of Construction Start: 01 Aug 1974      Lifetime Generation: 83237.8 GW(e).h  
 Date of First Criticality: 14 Dec 1982      Cumulative Energy Availability Factor: 85.6%  
 Date of Grid Connection: 28 Dec 1982      Cumulative Load Factor: 86.5%  
 Date of Commercial Operation: 10 Aug 1983      Cumulative Unit Capability Factor: 85.6%  
    Cumulative Energy Unavailability Factor: 14.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	1370.0	410.0	91.0	91.0	91.0	91.0	91.0	91.0	3662	99.7
1984	2595.3	403.0	75.7	80.3	75.6	80.2	73.3	78.5	6901	78.6
1985	2997.3	410.0	84.2	81.9	84.2	81.9	83.5	80.6	7491	85.5
1986	3114.6	410.0	87.1	83.4	87.1	83.4	86.7	82.4	7718	88.1
1987	2883.1	415.0	79.2	82.5	79.2	82.4	79.3	81.7	7107	81.1
1988	3076.9	415.0	85.8	83.1	85.8	83.1	84.4	82.2	7737	88.1
1989	3182.2	415.0	87.7	83.8	87.7	83.8	87.5	83.0	7929	90.5
1990	3216.8	415.0	87.2	84.3	87.2	84.3	88.5	83.8	7837	89.5
1991	2883.9	410.0	75.1	83.2	75.1	83.2	80.3	83.4	6823	77.9
1992	3498.9	430.0	84.9	83.4	84.9	83.4	92.6	84.4	7629	86.9
1993	3512.4	430.0	85.8	83.6	85.8	83.6	93.2	85.3	7637	87.2
1994	3441.5	430.0	89.9	84.2	89.8	84.2	91.4	85.8	8031	91.7
1995	3056.3	430.0	79.6	83.8	79.5	83.8	81.1	85.4	7088	80.9
1996	3472.7	430.0	90.7	84.3	90.6	84.3	91.9	85.9	8033	91.5
1997	3328.5	430.0	87.0	84.5	86.9	84.5	88.4	86.1	7646	87.3
1998	3487.7	430.0	92.4	85.1	92.4	85.0	92.6	86.5	8095	92.4
1999	3117.5	430.0	81.6	84.8	81.2	84.8	82.8	86.3	7240	82.6
2000	3192.1	430.0	82.5	84.7	82.3	84.6	84.5	86.2	7268	82.7
2001	3514.9	437.0	91.8	85.1	91.6	85.0	91.8	86.5	8069	92.1
2002	3330.7	437.0	90.2	85.4	90.1	85.3	87.0	86.5	7909	90.3
2003	3097.8	437.0	81.0	85.1	81.0	85.1	80.9	86.3	7197	82.1
2004	3342.3	437.0	87.1	85.2	87.1	85.2	87.1	86.3	7692	87.6
2005	3503.5	437.0	91.5	85.5	91.5	85.5	91.5	86.5	8029	91.7
2006	3468.5	437.0	90.8	85.8	90.8	85.7	90.6	86.7	7979	91.1
2007	3179.4	470.0	79.7	85.5	79.7	85.4	79.7	86.4	6933	79.1
2008	3670.3	470.0	88.9	85.6	88.9	85.6	89.1	86.5	7824	89.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		215			83	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	744			963	26	
D. Inspection, maintenance or repair without refuelling				17		
E. Testing of plant systems or component					0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					6	
Z. Others					7	
Subtotal	744	215	0	980	123	0
Total		959			1103	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		16
13. Reactor Auxiliary Systems	185	4
14. Safety Systems		1
15. Reactor Cooling System		13
16. Steam generation system		5
31. Turbine and auxiliaries	29	11
32. Feedwater and Main Steam System		10
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator System		0
42. Electrical Power Supply System		4
Total	214	64



## HU-2 PAKS-2

**Operator:** PAKS Zrt (PAKS NUCLEAR POWER PLANT LTD)

**Contractor:** AEE (ATOMENERGOEXPORT)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 443.0 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 2008

**Net Energy Production:** 2993.8 GW(e).h  
**Energy Availability Factor:** 76.2%  
**Load Factor:** 76.7%  
**Operating Factor:** 76.1%  
**Energy Unavailability Factor:** 23.8%  
**Total Off-line Time:** 2091 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	329.3	308.2	329.1	313.7	329.6	134.9	0.0	0.0	273.8	329.0	310.1	336.1	2993.8
<b>EAF (%)</b>	100.0	100.0	100.0	98.4	100.0	40.1	0.0	-0.1	84.9	99.7	97.2	95.6	76.2
<b>UCF (%)</b>	100.0	100.0	100.0	98.4	100.0	40.3	0.0	-0.1	84.9	99.7	97.2	95.6	76.2
<b>LF (%)</b>	99.9	103.5	99.9	98.5	100.0	42.3	0.0	0.0	85.8	99.7	97.2	95.5	76.7
<b>OF (%)</b>	100.0	103.6	99.9	97.5	100.0	40.3	0.0	0.0	80.6	100.0	94.7	100.0	76.1
<b>EUF (%)</b>	0.0	0.0	0.0	1.6	0.0	59.9	100.0	100.1	15.1	0.3	2.8	4.4	23.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	59.7	100.0	70.5	0.1	0.3	2.8	0.0	19.5
<b>UCLF (%)</b>	0.0	0.0	0.0	1.6	0.0	0.0	0.0	29.6	14.9	0.1	0.0	4.5	4.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE. REFERENCE UNIT POWER WAS UPDATED FROM 443 TO 473 MWE DUE TO EXCHANGED OF ROTORS IN ALL MAIN COOLING PUMPS. RELATED MODIFICATION AT HYDROACCUMULATORS: PRESSURE REDUCTION (FROM 60 TO 34 BAR), VOLUME EXPANSION BY INCREASING WATER LEVEL.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Aug 1974	<b>Lifetime Generation:</b>	73008.1 GW(e).h
<b>Date of First Criticality:</b>	26 Aug 1984	<b>Cumulative Energy Availability Factor:</b>	78.9%
<b>Date of Grid Connection:</b>	06 Sep 1984	<b>Cumulative Load Factor:</b>	79.8%
<b>Date of Commercial Operation:</b>	14 Nov 1984	<b>Cumulative Unit Capability Factor:</b>	79.0%
		<b>Cumulative Energy Unavailability Factor:</b>	21.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	584.2	425.0	94.1	94.1	94.1	94.1	97.3	97.3	1456	99.5
1985	3101.6	415.0	85.1	86.4	85.1	86.4	85.3	87.0	7695	87.8
1986	3148.3	415.0	86.0	86.2	86.0	86.2	86.6	86.8	7643	87.2
1987	3193.9	415.0	85.3	85.9	85.3	85.9	87.9	87.2	7770	88.7
1988	3046.3	415.0	81.9	85.0	81.9	85.0	83.6	86.3	7352	83.7
1989	3300.7	415.0	88.6	85.7	88.6	85.7	90.8	87.2	7962	90.9
1990	3338.2	425.0	88.0	86.1	88.0	86.1	89.7	87.6	7845	89.6
1991	3421.6	415.0	88.6	86.4	88.6	86.4	94.1	88.5	7912	90.3
1992	3174.9	433.0	76.0	85.1	76.0	85.1	83.5	87.8	6829	77.7
1993	3569.0	433.0	87.0	85.3	87.0	85.3	94.1	88.6	7731	88.3
1994	3440.4	433.0	89.5	85.7	89.4	85.7	90.7	88.8	8000	91.3
1995	3309.1	433.0	86.6	85.8	86.4	85.8	87.2	88.6	7657	87.4
1996	3019.9	433.0	79.5	85.3	79.4	85.3	79.4	87.8	7011	79.8
1997	3267.6	433.0	88.3	85.5	88.2	85.5	86.1	87.7	7807	89.1
1998	3206.7	433.0	88.3	85.7	88.2	85.7	84.5	87.5	7717	88.1
1999	3246.6	433.0	90.2	86.0	89.2	85.9	85.6	87.4	7780	88.8
2000	3059.3	433.0	80.1	85.6	80.0	85.5	80.4	86.9	7073	80.5
2001	3266.9	441.0	84.9	85.6	84.8	85.5	84.6	86.8	7484	85.4
2002	3338.5	441.0	86.7	85.7	86.5	85.6	86.4	86.8	7644	87.3
2003	918.8	441.0	23.8	82.3	23.8	82.2	23.8	83.4	2089	23.8
2004	1137.2	441.0	29.4	79.6	29.4	79.5	29.4	80.6	2620	29.8
2005	2929.5	441.0	75.8	79.4	75.8	79.4	75.8	80.4	6669	76.1
2006	2399.6	441.0	62.6	78.7	62.3	78.6	62.1	79.5	5493	62.7
2007	3477.0	443.0	89.2	79.1	89.2	79.0	89.6	80.0	7887	90.0
2008	2993.8	473.0	76.2	79.0	76.2	78.9	76.7	79.8	6669	76.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		379			530	
B. Refuelling without a maintenance outage					15	
C. Inspection, maintenance or repair combined with refuelling	1705			904	17	
D. Inspection, maintenance or repair without refuelling	42			99		
E. Testing of plant systems or component				1	0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					20	
L. Human factor related					7	
Z. Others					5	
Subtotal	1747	379	0	1004	594	0
Total		2126			1598	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		25
15. Reactor Cooling System		4
16. Steam generation system		9
17. Safety I&C Systems (excluding reactor I&C)		20
21. Fuel Handling and Storage Facilities		461
31. Turbine and auxiliaries	379	1
32. Feedwater and Main Steam System		0
41. Main Generator System		0
42. Electrical Power Supply System		2
Total	379	522

## HU-3 PAKS-3

**Operator:** PAKS Zrt (PAKS NUCLEAR POWER PLANT LTD)

**Contractor:** AEE (ATOMENERGOEXPORT)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 443.0 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 2008

**Net Energy Production:** 3530.4 GW(e).h  
**Energy Availability Factor:** 90.6%  
**Load Factor:** 91.0%  
**Operating Factor:** 90.9%  
**Energy Unavailability Factor:** 9.4%  
**Total Off-line Time:** 798 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	329.2	308.3	320.8	318.8	314.6	319.0	328.3	329.2	56.5	257.5	319.0	329.4	3530.4
<b>EAF (%)</b>	100.0	100.0	97.5	100.0	95.5	100.0	99.6	99.9	17.7	76.7	100.0	100.0	90.6
<b>UCF (%)</b>	100.0	100.0	97.5	100.0	95.5	100.0	99.6	99.9	18.5	76.7	100.0	100.0	90.7
<b>LF (%)</b>	99.9	103.6	97.3	100.1	95.4	100.0	99.6	99.9	17.7	78.0	100.0	99.9	91.0
<b>OF (%)</b>	100.0	103.6	95.6	100.1	91.9	100.0	100.0	100.0	20.3	79.1	100.0	100.0	90.9
<b>EUf (%)</b>	0.0	0.0	2.5	0.0	4.5	0.0	0.4	0.1	82.3	23.3	0.0	0.0	9.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	81.5	22.8	0.0	0.0	8.7
<b>UCLF (%)</b>	0.0	0.0	2.5	0.1	4.6	0.0	0.0	0.1	0.0	0.5	0.0	0.0	0.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1979      **Lifetime Generation:** 72936.7 GW(e).h  
**Date of First Criticality:** 15 Sep 1986      **Cumulative Energy Availability Factor:** 86.5%  
**Date of Grid Connection:** 28 Sep 1986      **Cumulative Load Factor:** 87.4%  
**Date of Commercial Operation:** 01 Dec 1986      **Cumulative Unit Capability Factor:** 87.0%  
**Cumulative Energy Unavailability Factor:** 13.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	314.1	427.0	99.6	99.6	99.6	99.6	101.7	101.7	744	100.0
1987	3209.6	415.0	87.0	87.9	87.0	87.9	88.3	89.3	7648	87.3
1988	3300.9	415.0	88.1	88.0	88.1	88.0	90.6	89.9	7874	89.6
1989	3140.5	415.0	82.4	86.2	82.4	86.2	86.4	88.8	7343	83.8
1990	3273.4	435.0	85.6	86.1	85.6	86.1	85.9	88.0	7755	88.5
1991	3256.0	410.0	84.2	85.7	84.2	85.7	90.7	88.6	7580	86.5
1992	3587.3	433.0	87.7	86.0	87.5	86.0	94.3	89.5	7852	89.4
1993	3177.9	433.0	77.6	84.8	77.4	84.8	83.8	88.7	6950	79.3
1994	3376.0	433.0	88.6	85.3	88.5	85.2	89.0	88.7	7884	90.0
1995	3392.8	433.0	89.2	85.7	89.0	85.7	89.4	88.8	7911	90.3
1996	3429.4	433.0	90.9	86.3	90.8	86.2	90.2	89.0	8136	92.6
1997	3066.1	433.0	81.1	85.8	80.9	85.7	80.8	88.2	7136	81.5
1998	3294.1	433.0	88.0	86.0	88.0	85.9	86.8	88.1	7566	86.4
1999	3445.7	433.0	92.3	86.5	92.2	86.4	90.8	88.3	8058	92.0
2000	3517.3	433.0	93.0	86.9	92.8	86.8	92.5	88.6	8163	92.9
2001	3040.4	433.0	80.7	86.5	80.3	86.4	80.2	88.0	7159	81.7
2002	3256.8	433.0	90.5	86.8	90.4	86.6	85.9	87.9	7900	90.2
2003	3008.3	433.0	87.8	86.8	80.5	86.3	79.3	87.4	7746	88.4
2004	3333.3	433.0	87.6	86.9	87.6	86.4	87.6	87.4	7732	88.0
2005	3038.7	433.0	80.1	86.5	80.1	86.0	80.1	87.0	7088	80.9
2006	3454.9	433.0	91.2	86.8	91.2	86.3	91.1	87.2	8007	91.4
2007	3396.0	443.0	87.5	86.8	87.5	86.3	87.5	87.2	7691	87.8
2008	3530.4	443.0	90.7	87.0	90.6	86.5	91.0	87.4	7962	90.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		97			125	
B. Refuelling without a maintenance outage					0	
C. Inspection, maintenance or repair combined with refuelling	727			865	121	
D. Inspection, maintenance or repair without refuelling				23		
E. Testing of plant systems or component				1	5	
Z. Others					11	
Subtotal	727	97	0	889	262	0
Total		824			1151	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		42
14. Safety Systems		0
15. Reactor Cooling System		0
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries	57	2
32. Feedwater and Main Steam System		21
42. Electrical Power Supply System	40	34
Total	97	113

## HU-4 PAKS-4

Operator: PAKS Zrt (PAKS NUCLEAR POWER PLANT LTD)

Contractor: AEE (ATOMENERGOEXPORT)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 3671.4 GW(e).h  
 Energy Availability Factor: 88.4%  
 Load Factor: 88.6%  
 Operating Factor: 89.7%  
 Energy Unavailability Factor: 11.6%  
 Total Off-line Time: 906 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	351.8	329.2	333.8	340.6	0.0	228.9	351.9	351.3	340.6	352.1	340.2	351.1	3671.4
EAF (%)	100.0	100.0	95.0	100.0	0.0	67.2	100.0	99.8	100.0	99.9	99.9	100.0	88.4
UCF (%)	100.0	100.0	95.0	100.0	0.0	67.2	100.0	99.8	100.0	99.9	99.9	100.0	88.4
LF (%)	100.0	103.6	94.9	100.1	0.0	67.2	100.0	99.8	100.0	99.9	99.9	99.8	88.6
OF (%)	100.0	103.6	99.9	100.1	0.0	74.2	100.0	100.0	100.0	100.0	100.0	100.0	89.7
EUF (%)	0.0	0.0	5.0	0.0	100.0	32.8	0.0	0.2	0.0	0.1	0.1	0.0	11.6
PUF (%)	0.0	0.0	0.0	0.0	100.0	17.5	0.0	0.0	0.0	0.0	0.1	0.0	9.9
UCLF (%)	0.0	0.0	5.0	0.0	0.0	15.3	0.0	0.2	0.0	0.1	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. 2008 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE

### 5. Historical Summary

Date of Construction Start: 01 Oct 1979      Lifetime Generation: 72386.1 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: 89.2%  
 Date of Commercial Operation: 01 Nov 1987      Cumulative Unit Capability Factor: 87.8%  
    Cumulative Energy Unavailability Factor: 12.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	618.3	425.0	100.0	100.0	100.0	100.0	101.8	101.8	1464	100.0
1988	3200.9	415.0	85.6	87.7	85.6	87.7	87.8	89.8	7564	86.1
1989	3425.3	415.0	89.7	88.6	89.7	88.6	94.2	91.8	7974	91.0
1990	3064.5	435.0	76.7	84.7	76.7	84.7	80.4	88.1	7253	82.8
1991	3343.0	410.0	86.5	85.2	86.5	85.2	93.1	89.3	7787	88.9
1992	3702.8	433.0	90.9	86.3	90.7	86.3	97.4	90.9	8082	92.0
1993	3537.2	430.0	87.5	86.5	87.0	86.4	93.9	91.4	7767	88.7
1994	2971.2	433.0	78.1	85.3	78.1	85.2	78.3	89.5	7019	80.1
1995	3443.8	433.0	90.8	86.0	90.4	85.9	90.8	89.7	8049	91.9
1996	3487.5	433.0	91.3	86.6	90.7	86.4	91.7	89.9	8087	92.1
1997	3487.1	433.0	92.0	87.1	91.6	86.9	91.9	90.1	8098	92.4
1998	3136.1	433.0	84.3	86.9	83.7	86.6	82.7	89.4	7389	84.3
1999	3464.0	433.0	89.3	87.1	89.3	86.8	91.3	89.6	8046	91.8
2000	3578.4	433.0	92.3	87.5	92.2	87.3	94.1	89.9	8116	92.4
2001	3471.7	444.0	90.1	87.7	90.0	87.5	89.3	89.9	7916	90.4
2002	3182.9	444.0	83.4	87.4	83.1	87.2	81.8	89.3	7287	83.2
2003	3607.6	444.0	93.0	87.7	92.8	87.5	92.8	89.6	8119	92.7
2004	3396.6	444.0	87.1	87.7	87.1	87.5	87.1	89.4	7878	89.7
2005	3548.8	444.0	91.2	87.9	91.2	87.7	91.2	89.5	8046	91.8
2006	3185.2	444.0	81.9	87.6	81.9	87.4	81.9	89.1	7196	82.1
2007	3810.4	473.0	92.0	87.8	92.0	87.6	92.0	89.3	8078	92.2
2008	3671.4	473.0	88.4	87.8	88.4	87.7	88.6	89.2	7854	89.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		109			56	
C. Inspection, maintenance or repair combined with refuelling	820			838	26	
D. Inspection, maintenance or repair without refuelling				5		
E. Testing of plant systems or component:				1		
H. Nuclear regulatory requirement				0		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				3		
L. Human factor related					3	
Z. Others					3	
Subtotal	820	109	0	847	88	0
Total		929			935	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		15
15. Reactor Cooling System:		15
16. Steam generation system:		5
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	109	5
32. Feedwater and Main Steam System		5
41. Main Generator System:		0
42. Electrical Power Supply System:		1
Total	109	47

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 1103.0 GW(e).h  
**Energy Availability Factor:** 63.1%  
**Load Factor:** 62.3%  
**Operating Factor:** 100.3%  
**Energy Unavailability Factor:** 36.9%  
**Total Off-line Time:** -24 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	93.3	85.3	93.3	90.2	93.4	90.9	94.7	94.2	90.0	93.2	90.8	93.7	1103.0
<b>EAF (%)</b>	63.1	60.3	63.1	62.9	63.1	63.5	64.0	63.7	62.9	63.1	63.4	63.4	63.1
<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>	62.1	62.8	62.1	62.1	62.1	62.5	63.0	62.7	61.9	61.9	62.4	62.4	62.3
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<b>EUF (%)</b>	36.9	39.7	36.9	37.1	36.9	36.5	36.0	36.3	37.1	36.9	36.6	36.6	36.9
<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	0.0	0.0	0.0
<b>XUF (%)</b>	36.9	39.7	36.9	37.1	36.9	36.5	36.0	36.3	37.1	36.9	36.6	36.6	36.9

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THIS UNIT OPERATED THROUGHOUT THE YEAR WITHOUT ANY OUTAGE. THIS UNIT IS CONTINUOUSLY OPERATING SINCE 30TH SEPTEMBER 2007 AND HAS COMPLETED 459 DAYS OF CONTINUOUS OPERATION AS ON 31/12/08.

### 5. Historical Summary

**Date of Construction Start:** 01 Sep 1989      **Lifetime Generation:** 10093.9 GW(e).h  
**Date of First Criticality:** 26 Sep 2000      **Cumulative Energy Availability Factor:** 72.2%  
**Date of Grid Connection:** 12 Oct 2000      **Cumulative Load Factor:** 70.7%  
**Date of Commercial Operation:** 16 Nov 2000      **Cumulative Unit Capability Factor:** 90.3%  
**Cumulative Energy Unavailability Factor:** 27.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2000	188.4	200.0	86.9	86.9	86.9	86.9	64.4	64.4	1037	70.8
2001	1241.1	200.0	75.8	77.4	70.4	72.8	70.8	69.9	6316	72.1
2002	1692.9	202.0	95.6	85.8	92.4	81.9	95.7	81.9	8082	92.3
2003	1336.0	202.0	87.5	86.4	83.4	82.4	75.5	79.8	7255	82.8
2004	1344.9	202.0	94.6	88.4	77.8	81.3	75.8	78.9	8181	93.1
2005	1183.6	202.0	88.9	88.5	66.5	78.4	66.9	76.5	7580	86.5
2006	1167.3	202.0	97.4	89.9	67.0	76.5	66.0	74.8	8524	97.3
2007	946.3	202.0	82.9	88.9	54.4	73.4	53.5	71.8	7250	82.8
2008	1103.0	202.0	100.0	90.3	63.1	72.2	62.3	70.7	8784	100.3



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2000 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					516	
B. Refuelling without a maintenance					20	
D. Inspection, maintenance or repair without refuelling				199		
E. Testing of plant systems or component				12	0	
H. Nuclear regulatory requirement					28	
J. Grid limitation, failure or grid unavailability						176
Z. Others					24	
Subtotal	0	0	0	211	588	176
Total	0			975		

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

System	2008 Hours Lost	2000 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		33
12. Reactor I&C Systems		35
13. Reactor Auxiliary Systems		6
14. Safety Systems		22
15. Reactor Cooling Systems		17
17. Safety I&C Systems (excluding reactor I&C)		23
21. Fuel Handling and Storage Facilities		55
31. Turbine and auxiliaries		71
32. Feedwater and Main Steam System		28
35. All other I&C Systems		0
41. Main Generator Systems		203
42. Electrical Power Supply Systems		7
XX. Miscellaneous Systems		11
Total	0	511

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 816.5 GW(e).h  
**Energy Availability Factor:** 46.9%  
**Load Factor:** 46.1%  
**Operating Factor:** 80.4%  
**Energy Unavailability Factor:** 53.1%  
**Total Off-line Time:** 1720 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	82.7	0.0	34.0	83.8	87.8	86.0	89.1	30.3	74.3	78.5	83.5	86.4	816.5
<b>EAF (%)</b>	56.0	-2.5	23.6	58.5	59.4	60.1	60.3	21.2	52.1	53.3	58.4	58.5	46.9
<b>UCF (%)</b>	96.8	-2.6	43.4	100.0	100.0	100.0	100.0	98.9	90.2	91.8	100.0	100.0	85.5
<b>LF (%)</b>	55.1	0.0	22.6	57.7	58.4	59.2	59.3	20.2	51.1	52.2	57.4	57.5	46.1
<b>OF (%)</b>	96.8	0.0	42.9	100.1	100.0	100.0	100.0	37.5	90.0	91.5	100.0	100.0	80.4
<b>EUF (%)</b>	44.0	102.5	76.4	41.5	40.6	39.9	39.7	78.8	47.9	46.7	41.6	41.5	53.1
<b>PUF (%)</b>	0.0	81.3	31.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
<b>UCLF (%)</b>	3.2	21.2	24.7	0.0	0.0	0.0	0.0	1.1	9.9	8.2	0.0	0.0	5.6
<b>XUF (%)</b>	40.8	0.0	19.8	41.5	40.6	39.9	39.7	77.7	38.1	38.5	41.6	41.5	38.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THIS UNIT ACHIEVED AVAILABILITY FACTOR OF 80.15%. THIS UNIT HAD OPERATED CONTINUOUSLY FROM 19TH AUGUST 2006 TILL 31ST JANUARY 2008 AND COMPLETED 529 DAYS OF CONTINUOUS OPERATION, WHICH IS ONE OF THE BEST OPERATING PERFORMANCES IN THE WORLD.

### 5. Historical Summary

**Date of Construction Start:** 01 Dec 1989 **Lifetime Generation:** 11033.6 GW(e).h  
**Date of First Criticality:** 24 Sep 1999 **Cumulative Energy Availability Factor:** 72.3%  
**Date of Grid Connection:** 02 Dec 1999 **Cumulative Load Factor:** 71.0%  
**Date of Commercial Operation:** 16 Mar 2000 **Cumulative Unit Capability Factor:** 88.8%  
**Cumulative Energy Unavailability Factor:** 27.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2000	1036.0	200.0	76.9	76.9	76.9	76.9	70.5	70.5	5428	73.9
2001	1308.6	200.0	82.1	79.7	74.2	75.5	74.7	72.8	6670	76.1
2002	1559.2	202.0	87.5	82.5	85.8	79.1	88.1	78.2	7455	85.1
2003	1413.0	202.0	88.7	84.1	86.9	81.2	79.9	78.7	7535	86.0
2004	1290.2	202.0	91.0	85.6	74.7	79.8	72.7	77.4	7732	88.0
2005	1509.4	202.0	96.4	87.4	82.9	80.4	85.3	78.8	8428	96.2
2006	1064.2	202.0	89.2	87.7	61.1	77.5	60.1	76.0	7806	89.1
2007	1083.1	202.0	100.0	89.3	62.2	75.6	61.2	74.1	8757	100.0
2008	816.5	202.0	85.5	88.8	46.9	72.3	46.1	71.0	7040	80.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2000 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		309			595	
D. Inspection, maintenance or repair without refuelling	792			263	21	
E. Testing of plant systems or component:					3	
J. Grid limitation, failure or grid unavailability					0	172
L. Human factor related		185				
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.			456			
Z. Others					6	
Subtotal	792	494	456	263	625	172
Total		1742			1060	

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

System	2008 Hours Lost	2000 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems	167	118
13. Reactor Auxiliary Systems		11
15. Reactor Cooling System	80	54
16. Steam generation system	5	
17. Safety I&C Systems (excluding reactor I&C)		40
31. Turbine and auxiliaries		248
32. Feedwater and Main Steam System		40
41. Main Generator System		26
42. Electrical Power Supply System		42
XX. Miscellaneous Systems	56	
Total	308	590

## 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**  
**at the beginning of 2008:** 202.0 MW(e)  
**Design Net Capacity:** 202.0 MW(e)  
**Design Discharge Burnup:** —  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 372.0 GW(e).h  
**Energy Availability Factor:** 21.7%  
**Load Factor:** 21.0%  
**Operating Factor:** 28.9%  
**Energy Unavailability Factor:** 78.3%  
**Total Off-line Time:** 6228 hours

### 3. 2008 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	92.4	0.0	119.7	79.1	0.0	0.0	27.9	52.9	0.0	372.0
EAF (%)	1.0	-2.5	1.0	64.5	1.0	83.3	53.6	1.0	1.0	19.7	37.4	1.0	21.7
UCF (%)	1.0	-2.6	1.0	73.5	1.0	88.1	100.0	100.0	100.0	100.0	100.0	100.0	63.8
LF (%)	0.0	0.0	0.0	63.6	0.0	82.3	52.6	0.0	0.0	18.5	36.4	0.0	21.0
OF (%)	0.0	0.0	0.0	73.4	0.0	87.9	71.2	0.0	0.0	38.5	76.9	0.0	28.9
EUF (%)	99.0	102.5	99.0	35.5	99.0	16.7	46.4	99.0	99.0	80.3	62.6	99.0	78.3
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UCLF (%)	99.0	102.6	99.0	26.5	99.0	11.9	0.0	0.0	0.0	0.0	0.0	0.0	36.2
XUF (%)	0.0	0.0	0.0	9.0	0.0	4.8	46.4	99.0	99.0	80.3	62.6	99.0	42.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR OF 28.82%. UNIT WAS SYNCHRONIZED ON 01/04/2008 AT 00:53 AFTER GENERATOR REHABILITATION JOBS. UNIT OPERATED AT A REDUCED POWER LEVEL BETWEEN 50 TO 90% DUE TO MISMATCH IN FUEL DEMAND AND SUPPLY.

### 5. Historical Summary

**Date of Construction Start:** 30 Mar 2002 **Lifetime Generation:** 725.4 GW(e).h  
**Date of First Criticality:** 26 Feb 2007 **Cumulative Energy Availability Factor:** 25.0%  
**Date of Grid Connection:** 11 Apr 2007 **Cumulative Load Factor:** 24.4%  
**Date of Commercial Operation:** 06 May 2007 **Cumulative Unit Capability Factor:** 52.1%  
**Cumulative Energy Unavailability Factor:** 75.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2007	348.4	202.0	34.8	34.8	29.9	29.9	29.3	29.3	2008	34.1
2008	372.0	202.0	63.8	52.1	21.7	25.0	21.0	24.4	2532	28.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2007 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		3207			1809	
E. Testing of plant systems or component:					240	
J. Grid limitation, failure or grid unavailability					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.			3045			
Subtotal	0	3207	3045	0	2078	0
Total		6252			2078	

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

System	2008 Hours Lost	2007 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		22
31. Turbine and auxiliaries		122
41. Main Generator System	3207	1582
42. Electrical Power Supply System		81
Total	3207	1807

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 438.1 GW(e).h  
**Energy Availability Factor:** 30.0%  
**Load Factor:** 24.7%  
**Operating Factor:** 47.9%  
**Energy Unavailability Factor:** 70.0%  
**Total Off-line Time:** 4574 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	82.6	66.6	71.5	77.4	74.7	65.4	0.0	0.0	0.0	0.0	0.0	0.0	438.1
<b>EAF (%)</b>	61.4	54.4	55.5	61.4	56.1	51.7	3.5	3.5	3.5	3.5	3.5	3.5	30.0
<b>UCF (%)</b>	100.0	88.3	90.1	100.0	100.0	100.0	3.5	3.5	3.5	3.5	3.5	3.5	49.7
<b>LF (%)</b>	54.9	47.4	47.6	53.2	49.7	45.0	0.0	0.0	0.0	0.0	0.0	0.0	24.7
<b>OF (%)</b>	100.0	87.9	89.9	100.0	100.0	100.0	0.1	0.0	0.0	0.0	0.0	0.0	47.9
<b>EUF (%)</b>	38.6	45.6	44.5	38.6	43.9	48.3	96.5	96.5	96.5	96.5	96.5	96.5	70.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	96.5	96.5	96.5	96.5	96.5	96.5	48.5
<b>UCLF (%)</b>	0.0	11.8	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8
<b>XUF (%)</b>	38.6	33.9	34.6	38.6	43.9	48.3	0.0	0.0	0.0	0.0	0.0	0.0	19.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

ON 1ST JULY 2008, THE UNIT WAS PLANNED SHUTDOWN FOR ENMASSE COOLANT CHANNEL REPLACEMENT WORK. THIS SHUTDOWN WILL LAST FOR ABOUT 24 MONTHS. FURTHER, DURING THE YEAR UNIT OPERATED AT A REDUCED POWER LEVEL BETWEEN 50 TO 60% OF FULL POWER DUE TO MISMATCH IN FUEL DEMAND AND SUPPLY.

### 5. Historical Summary

**Date of Construction Start:** 01 Dec 1984  
**Date of First Criticality:** 03 Sep 1992  
**Date of Grid Connection:** 24 Nov 1992  
**Date of Commercial Operation:** 06 May 1993

**Lifetime Generation:** 16888.5 GW(e).h  
**Cumulative Energy Availability Factor:** 67.4%  
**Cumulative Load Factor:** 63.7%  
**Cumulative Unit Capability Factor:** 76.4%  
**Cumulative Energy Unavailability Factor:** 32.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1993			Data not provided							
1994	130.3	194.0	13.2	13.2	12.0	12.0	7.7	7.7	1049	12.0
1995	1089.1	195.0	70.5	41.9	66.5	39.3	63.8	35.8	6225	71.1
1996	1295.8	195.0	84.6	56.2	75.7	51.5	75.7	49.1	7539	85.8
1997	906.7	195.0	58.4	56.8	52.9	51.8	53.1	50.1	5140	58.7
1998	1090.6	195.0	67.0	58.8	63.1	54.1	63.8	52.9	5987	68.3
1999	1407.1	195.0	87.7	63.6	85.1	59.2	82.4	57.8	7450	85.0
2000	1645.4	195.0	95.2	68.2	94.5	64.3	96.1	63.3	8445	96.1
2001	1517.5	195.0	86.5	70.4	86.5	67.1	88.8	66.5	7690	87.8
2002	1697.8	202.0	96.8	73.5	96.7	70.5	95.9	69.8	8488	96.9
2003	1419.4	202.0	87.5	74.9	81.9	71.6	80.2	70.9	7622	87.0
2004	1064.4	202.0	89.1	76.2	89.1	73.3	60.0	69.9	7416	84.4
2005	1089.4	202.0	94.2	77.8	63.1	72.4	61.6	69.2	7969	91.0
2006	985.6	202.0	83.9	78.2	59.8	71.4	55.7	68.1	7316	83.5
2007	828.7	202.0	80.5	78.4	53.3	70.1	46.8	66.6	6867	78.4
2008	438.1	202.0	49.7	76.4	30.0	67.4	24.7	63.7	4210	47.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1994 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		158			560	
D. Inspection, maintenance or repair without refuelling				897		
E. Testing of plant systems or component				79	68	
F. Major back-fitting, refurbishment or upgrading activities with refuelling	4415					
G. Major back-fitting, refurbishment or upgrading activities without refuelling						22
H. Nuclear regulatory requirement					75	
J. Grid limitation, failure or grid unavailability						68
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					12	9
L. Human factor related					6	
Subtotal	4415	158	0	976	721	99
Total		4573			1796	

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

System	2008 Hours Lost	1994 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		46
12. Reactor I&C Systems		46
13. Reactor Auxiliary System		16
15. Reactor Cooling System	158	107
16. Steam generation system		12
17. Safety I&C Systems (excluding reactor I&C)		15
31. Turbine and auxiliaries		113
32. Feedwater and Main Steam System		16
35. All other I&C Systems		15
41. Main Generator System		90
42. Electrical Power Supply System		55
Total	158	531

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 938.1 GW(e).h  
**Energy Availability Factor:** 60.1%  
**Load Factor:** 52.9%  
**Operating Factor:** 97.9%  
**Energy Unavailability Factor:** 39.9%  
**Total Off-line Time:** 188 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	82.3	77.0	81.2	78.4	80.8	62.9	79.9	81.2	78.8	81.0	78.5	76.1	938.1
<b>EAF (%)</b>	61.4	61.4	61.4	61.4	61.4	50.5	61.4	61.4	61.4	61.4	61.4	56.8	60.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	81.6	100.0	100.0	100.0	100.0	100.0	92.2	97.8
<b>LF (%)</b>	54.8	54.8	54.0	53.9	53.7	43.3	53.2	54.1	54.2	53.9	54.0	50.7	52.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	81.7	100.0	100.0	100.0	100.0	100.0	92.5	97.9
<b>EUF (%)</b>	38.6	38.6	38.6	38.6	38.6	49.5	38.6	38.6	38.6	38.6	38.6	43.2	39.9
<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	18.4	0.0	0.0	0.0	0.0	0.0	7.8	2.2
<b>XUF (%)</b>	38.6	38.6	38.6	38.6	38.6	31.1	38.6	38.6	38.6	38.6	38.6	35.4	37.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THIS UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR OF 97.86%. DURING THE YEAR UNIT OPERATED AT A REDUCED POWER LEVEL OF 60% FULL POWER DUE TO MISMATCH IN FUEL DEMAND AND SUPPLY.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1985 **Lifetime Generation:** 17473.0 GW(e).h  
**Date of First Criticality:** 08 Jan 1995 **Cumulative Energy Availability Factor:** 78.0%  
**Date of Grid Connection:** 04 Mar 1995 **Cumulative Load Factor:** 74.4%  
**Date of Commercial Operation:** 01 Sep 1995 **Cumulative Unit Capability Factor:** 88.3%  
**Cumulative Energy Unavailability Factor:** 22.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1995	452.7	196.0	92.0	92.0	88.2	88.2	79.3	79.3	2513	85.8
1996	1326.8	195.0	86.3	87.7	77.5	80.2	77.5	77.9	7663	87.2
1997	1093.4	195.0	66.7	78.7	63.8	73.2	64.0	72.0	6139	70.1
1998	1291.6	195.0	78.7	78.7	76.6	74.2	75.6	73.1	6932	79.1
1999	1512.3	195.0	92.4	81.8	91.1	78.1	88.5	76.6	7955	90.8
2000	1489.9	195.0	85.8	82.6	85.6	79.5	87.0	78.6	7697	87.6
2001	1685.4	195.0	96.0	84.7	95.3	82.0	98.7	81.7	8500	97.0
2002	1597.1	202.0	89.5	85.4	89.2	83.0	90.3	82.9	7940	90.6
2003	1613.2	202.0	97.3	86.8	92.3	84.1	91.2	84.0	8515	97.2
2004	1142.0	202.0	90.9	87.3	90.9	84.9	64.4	81.8	7658	87.2
2005	1255.0	202.0	92.9	87.8	72.3	83.6	70.9	80.7	7979	91.1
2006	865.8	202.0	74.6	86.7	53.1	80.9	48.9	77.9	6473	73.9
2007	1011.7	202.0	97.0	87.5	63.1	79.4	57.2	76.2	8447	96.4
2008	938.1	202.0	97.8	88.3	60.1	78.0	52.9	74.4	8596	97.9



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1995 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		187			499	
B. Refuelling without a maintenance outage					10	
D. Inspection, maintenance or repair without refuelling				359	52	
E. Testing of plant systems or component				10	24	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						4
H. Nuclear regulatory requirement					63	
J. Grid limitation, failure or grid unavailability						35
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	
Z. Others					0	
Subtotal	0	187	0	369	651	39
Total		187			1059	

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

System	2008 Hours Lost	1995 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		29
13. Reactor Auxiliary System		10
14. Safety Systems		11
15. Reactor Cooling System		25
16. Steam generation system		14
17. Safety I&C Systems (excluding reactor I&C)		38
31. Turbine and auxiliaries	131	112
32. Feedwater and Main Steam System		94
35. All other I&C Systems		4
41. Main Generator System		75
42. Electrical Power Supply System	55	71
Total	186	483

# 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 697.9 GW(e).h  
 Energy Availability Factor: 38.6%  
 Load Factor: 38.9%  
 Operating Factor: 77.5%  
 Energy Unavailability Factor: 61.4%  
 Total Off-line Time: 1969 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	74.6	69.5	77.7	38.5	16.3	41.4	74.7	35.5	78.3	74.2	50.2	67.0	697.9
EAF (%)	48.9	46.9	50.9	26.0	10.7	28.1	49.0	23.3	53.0	48.7	34.0	43.9	38.6
UCF (%)	100.0	100.0	100.0	54.6	26.8	61.9	100.0	49.5	100.0	93.1	61.6	80.7	77.3
LF (%)	48.9	50.4	50.9	26.2	10.7	28.1	49.0	23.3	53.0	48.6	34.0	43.9	38.9
OF (%)	100.0	103.6	100.0	54.8	26.7	61.9	100.0	49.5	100.0	93.0	61.5	80.6	77.5
EUf (%)	51.1	53.1	49.1	74.0	89.3	71.9	51.0	76.7	47.0	51.3	66.0	56.1	61.4
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	45.4	73.2	38.1	0.0	50.5	0.0	6.9	38.4	19.3	22.7
XUF (%)	51.1	53.1	49.1	28.6	16.1	33.8	51.0	26.2	47.0	44.4	27.6	36.8	38.7

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

UNIT ACHIEVED AN AVAILABILITY FACTOR OF 77%.

## 5. Historical Summary

Date of Construction Start: 01 Jan 1971      Lifetime Generation: 20443.9 GW(e).h  
 Date of First Criticality: 02 Jul 1983      Cumulative Energy Availability Factor: 53.6%  
 Date of Grid Connection: 23 Jul 1983      Cumulative Load Factor: 48.8%  
 Date of Commercial Operation: 27 Jan 1984      Cumulative Unit Capability Factor: 59.1%  
    Cumulative Energy Unavailability Factor: 46.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	1115.8	210.0	61.0	61.0	60.5	60.5	60.5	60.5	6333	72.1
1985	822.1	215.0	50.1	55.5	49.5	54.9	43.6	52.0	4827	55.1
1986	757.1	220.0	40.7	50.5	39.3	49.6	39.3	47.7	4629	52.8
1987	1100.0	220.0	61.0	53.2	57.1	51.5	57.1	50.1	6047	69.0
1988	1258.0	220.0	65.7	55.7	65.1	54.3	65.1	53.1	6691	76.2
1989	404.6	220.0	21.0	49.8	21.0	48.7	21.0	47.7	4350	49.7
1990	863.7	215.0	47.8	49.6	45.6	48.2	45.9	47.4	7320	83.6
1991	499.9	215.0	44.8	49.0	44.4	47.7	26.5	44.9	3546	40.5
1992	1082.6	194.0	87.3	52.8	84.6	51.5	63.5	46.7	7412	84.4
1993	538.9	194.0	46.3	52.2	43.9	50.8	31.7	45.4	3836	43.8
1994	809.0	194.0	72.5	53.9	66.6	52.1	47.6	45.5	5974	68.2
1995	1085.2	194.0	98.4	57.4	86.8	54.8	63.9	47.0	7584	86.6
1996	617.1	161.0	50.6	57.0	50.6	54.5	43.7	46.8	4348	49.5
1997	893.0	150.0	74.3	57.9	68.0	55.2	68.0	47.9	6451	73.6
1998	703.4	150.0	56.1	57.8	55.5	55.2	53.5	48.2	4858	55.5
1999	1182.4	150.0	92.5	59.5	92.5	57.0	90.0	50.2	8095	92.4
2000	667.8	150.0	50.9	59.1	50.9	56.8	50.7	50.2	4468	50.9
2001	1174.5	150.0	90.1	60.4	88.5	58.1	89.4	51.9	7751	88.5
2002	895.8	155.0	69.7	60.8	67.7	58.6	66.0	52.5	5885	67.2
2003	810.6	155.0	65.3	61.0	65.3	58.8	59.7	52.8	5421	61.9
2004	0.0	155.0	0.0	58.6	0.0	56.5	0.0	50.7	0	0.0
2005	0.0	155.0	0.0	56.3	0.0	54.3	0.0	48.8	0	0.0
2006	1225.0	185.0	89.3	57.9	68.6	55.0	70.2	49.8	7823	89.3
2007	695.8	205.0	66.4	58.3	39.3	54.3	38.7	49.3	5814	66.4
2008	697.9	205.0	77.3	59.1	38.6	53.6	38.9	48.8	6791	77.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1116			904	7
B. Refuelling without a maintenance					7	
D. Inspection, maintenance or repair without refuelling				696		
E. Testing of plant systems or components		865		11	22	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				367		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				351		
H. Nuclear regulatory requirement				634		
J. Grid limitation, failure or grid unavailability					7	105
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					20	
Subtotal	0	1981	0	2059	960	112
Total		1981			3131	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		148
12. Reactor I&C Systems		77
13. Reactor Auxiliary Systems		25
15. Reactor Cooling Systems		74
16. Steam generation systems		28
31. Turbine and auxiliaries	162	95
32. Feedwater and Main Steam System	578	38
35. All other I&C Systems		4
41. Main Generator Systems		28
42. Electrical Power Supply Systems		348
XX. Miscellaneous Systems	375	5
Total	1115	870

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 715.7 GW(e).h  
**Energy Availability Factor:** 38.8%  
**Load Factor:** 40.4%  
**Operating Factor:** 80.8%  
**Energy Unavailability Factor:** 61.2%  
**Total Off-line Time:** 1680 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	75.1	70.0	66.9	71.5	74.6	72.4	55.9	0.0	51.6	76.5	76.0	25.2	715.7
<b>EAF (%)</b>	48.5	46.4	43.0	47.6	48.1	48.3	35.7	0.0	34.0	49.5	50.8	15.3	38.8
<b>UCF (%)</b>	100.0	100.0	89.4	100.0	100.0	100.0	75.2	0.0	70.8	100.0	100.0	32.6	80.4
<b>LF (%)</b>	50.0	51.5	44.5	49.3	49.6	49.8	37.2	0.0	35.5	50.8	52.3	16.8	40.4
<b>OF (%)</b>	100.0	103.6	89.7	100.1	100.0	100.0	75.5	0.0	71.3	99.9	100.0	33.6	80.8
<b>EUF (%)</b>	51.5	53.6	57.0	52.4	51.9	51.7	64.3	100.0	66.0	50.5	49.2	84.7	61.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	24.8	100.0	29.2	0.0	0.0	0.0	13.0
<b>UCLF (%)</b>	0.0	0.0	10.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.4	6.6
<b>XUF (%)</b>	51.5	53.6	46.4	52.4	51.9	51.7	39.5	0.0	36.9	50.5	49.2	17.3	41.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR OF 81%. BIENNIAL MAINTENANCE OUTAGE OF THE UNIT WAS TAKEN UP WHICH LASTED FOR ABOUT 47 DAYS

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1972      **Lifetime Generation:** 20668.7 GW(e).h  
**Date of First Criticality:** 12 Aug 1985      **Cumulative Energy Availability Factor:** 59.2%  
**Date of Grid Connection:** 20 Sep 1985      **Cumulative Load Factor:** 55.5%  
**Date of Commercial Operation:** 21 Mar 1986      **Cumulative Unit Capability Factor:** 66.4%  
**Cumulative Energy Unavailability Factor:** 40.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	649.9	220.0	40.2	40.2	40.2	40.2	40.2	40.2	4409	60.0
1987	1066.0	220.0	62.5	52.3	55.5	48.5	55.3	48.4	6382	72.9
1988	642.0	220.0	33.2	45.6	33.2	43.1	33.2	43.1	3535	40.2
1989	438.2	220.0	22.7	39.6	22.7	37.8	22.7	37.8	4350	49.7
1990	1082.4	215.0	61.6	44.1	57.2	41.7	57.5	41.8	7726	88.2
1991	1083.0	215.0	87.2	51.4	86.6	49.3	57.5	44.4	7642	87.2
1992	665.2	194.0	55.2	51.9	54.2	50.0	39.0	43.7	4751	54.1
1993	950.3	205.0	80.2	55.3	77.1	53.3	52.9	44.8	6625	75.6
1994	1032.1	194.0	85.5	58.5	80.9	56.1	60.7	46.5	7071	80.7
1995	274.7	194.0	22.7	55.1	21.4	52.9	16.2	43.6	1871	21.4
1996	1061.9	161.0	84.7	57.3	82.2	55.0	75.1	45.9	7256	82.6
1997	958.2	150.0	75.6	58.4	72.4	56.1	72.9	47.6	6464	73.8
1998	1104.2	150.0	87.0	60.1	85.4	57.8	84.0	49.8	7478	85.4
1999	879.9	150.0	68.0	60.6	65.7	58.3	67.0	50.8	5755	65.7
2000	1273.4	150.0	95.7	62.4	94.6	60.2	96.6	53.2	8304	94.5
2001	1119.1	150.0	88.5	63.7	87.6	61.6	85.2	54.8	7671	87.6
2002	22.7	155.0	1.7	60.7	1.7	58.6	1.7	52.2	183	2.1
2003	589.1	155.0	40.0	59.7	40.0	57.7	43.4	51.8	3135	35.8
2004	1274.3	155.0	92.4	61.2	90.9	59.2	93.6	53.7	7970	90.7
2005	1475.8	155.0	92.5	62.5	91.3	60.6	108.7	56.0	8165	93.2
2006	1086.6	202.0	90.0	64.0	59.9	60.6	61.4	56.3	7894	90.1
2007	971.1	202.0	97.4	65.7	54.1	60.3	54.9	56.2	8537	97.5
2008	715.7	202.0	80.4	66.4	38.8	59.2	40.4	55.5	7080	80.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		571			825	5
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling					9	
D. Inspection, maintenance or repair without refuelling	1132			586		
E. Testing of plant systems or component				52	8	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				561		
H. Nuclear regulatory requirement				141	5	
J. Grid limitation, failure or grid unavailability					3	93
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					7	16
Subtotal	1132	571	0	1340	864	114
Total		1703			2318	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		241
12. Reactor I&C Systems		53
13. Reactor Auxiliary System		10
14. Safety Systems		4
15. Reactor Cooling System		153
16. Steam generation system		38
17. Safety I&C Systems (excluding reactor I&C)	77	11
21. Fuel Handling and Storage Facilities		7
31. Turbine and auxiliaries	494	70
32. Feedwater and Main Steam System		28
35. All other I&C Systems		3
41. Main Generator System		50
42. Electrical Power Supply System		51
XX. Miscellaneous Systems		13
Total	571	732

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 567.2 GW(e).h  
**Energy Availability Factor:** 33.5%  
**Load Factor:** 32.1%  
**Operating Factor:** 68.1%  
**Energy Unavailability Factor:** 66.5%  
**Total Off-line Time:** 2797 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	0.0	3.9	62.3	59.0	69.3	70.4	67.9	78.9	68.5	11.7	67.4	7.8	567.2
EAF (%)	0.0	-0.4	43.4	42.4	48.1	50.4	47.2	54.5	49.1	9.9	48.4	7.2	33.5
UCF (%)	0.0	11.6	100.0	100.0	100.0	100.0	90.1	100.0	92.1	23.3	100.0	100.0	76.7
LF (%)	0.0	2.9	41.4	40.6	46.1	48.4	45.2	52.5	47.1	7.8	46.4	5.2	32.1
OF (%)	0.0	15.2	92.6	87.2	100.0	100.0	89.9	100.0	91.9	21.6	100.0	16.8	68.1
EUF (%)	100.0	100.4	56.6	57.6	51.9	49.6	52.8	45.5	50.9	90.1	51.6	92.8	66.5
PUF (%)	100.0	88.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.3
UCLF (%)	0.0	0.3	0.0	0.0	0.0	0.0	9.9	0.0	7.9	76.7	0.0	0.0	8.0
XUF (%)	0.0	12.0	56.6	57.6	51.9	49.6	42.9	45.5	43.0	13.4	51.6	92.8	43.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

AFTER COMPLETION OF ENMASSE COOLANT CHANNEL REPLACEMENT WORK, THE UNIT WAS SYNCHRONIZED ON 25TH FEBRUARY 2008. IT ACHIEVED AN ANNUAL AVAILABILITY FACTOR OF 80.04%.

### 5. Historical Summary

**Date of Construction Start:** 01 Dec 1976 **Lifetime Generation:** 16879.2 GW(e).h  
**Date of First Criticality:** 12 Mar 1989 **Cumulative Energy Availability Factor:** 55.1%  
**Date of Grid Connection:** 29 Jul 1989 **Cumulative Load Factor:** 52.4%  
**Date of Commercial Operation:** 01 Jan 1991 **Cumulative Unit Capability Factor:** 61.8%  
**Cumulative Energy Unavailability Factor:** 44.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1991	449.3	210.0	42.8	42.8	42.3	42.3	24.4	24.4	4331	49.4
1992	742.7	200.0	42.8	42.8	42.3	42.3	42.3	33.1	5514	62.8
1993	339.6	200.0	19.4	35.1	19.4	34.8	19.4	28.6	2032	23.2
1994	0.0	200.0	0.0	26.5	0.0	26.2	0.0	21.6	0	0.0
1995	944.4	200.0	68.3	34.7	66.0	34.1	53.9	28.0	5740	65.5
1996	1162.3	200.0	76.9	41.7	66.2	39.4	66.2	34.3	6407	72.9
1997	1585.2	200.0	92.8	49.0	89.3	46.5	90.5	42.3	8128	92.8
1998	1485.6	200.0	90.8	54.2	83.9	51.1	84.8	47.5	7986	91.2
1999	1128.6	200.0	76.8	56.7	76.5	53.9	64.4	49.4	6703	76.5
2000	1386.3	200.0	87.2	59.7	83.4	56.8	78.9	52.3	7452	84.8
2001	1563.0	200.0	91.9	62.6	89.2	59.8	89.2	55.7	8157	93.1
2002	1574.5	202.0	89.3	64.9	88.0	62.1	89.0	58.5	7912	90.3
2003	1528.2	202.0	95.1	67.2	86.0	64.0	86.4	60.6	8254	94.2
2004	1120.6	202.0	82.5	68.3	64.8	64.0	63.2	60.8	6860	78.1
2005	1064.8	202.0	80.5	69.1	62.4	63.9	60.2	60.8	6924	79.0
2006	0.0	202.0	0.0	64.8	0.0	59.9	0.0	57.0	0	0.0
2007	0.0	202.0	0.0	61.0	0.0	56.4	0.0	53.6	0	0.0
2008	567.2	202.0	76.7	61.8	33.5	55.1	32.1	52.4	5963	68.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1991 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		719			970	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling				109		
D. Inspection, maintenance or repair without refuelling				717		
E. Testing of plant systems or component				26	20	
F. Major back-fitting, refurbishment or upgrading activities with refuelling	1336			81		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				973	19	
H. Nuclear regulatory requirement				106	11	
J. Grid limitation, failure or grid unavailability			148			66
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						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.)			619			
Z. Others						3
Subtotal	1336	719	767	2012	1021	82
Total		2822			3115	

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

System	2008 Hours Lost	1991 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		27
12. Reactor I&C Systems	1	65
13. Reactor Auxiliary System		25
15. Reactor Cooling System	583	121
16. Steam generation system		10
17. Safety I&C Systems (excluding reactor I&C)		33
21. Fuel Handling and Storage Facilities		2
31. Turbine and auxiliaries	2	477
32. Feedwater and Main Steam System		22
33. Circulating Water System		2
41. Main Generator System	75	81
42. Electrical Power Supply System	58	64
XX. Miscellaneous Systems		2
Total	719	931

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** -0.3%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.3%  
**Total Off-line Time:** 8760 hours

### 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
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. 2008 Summary of Operation

UNIT REMAINED SHUTDOWN THROUGHOUT THE YEAR FOR ENMASSE COOLANT CHANNEL REPLACEMENT WORK.

### 5. Historical Summary

**Date of Construction Start:** 01 Nov 1977      **Lifetime Generation:** 17988.0 GW(e).h  
**Date of First Criticality:** 24 Oct 1991      **Cumulative Energy Availability Factor:** 62.9%  
**Date of Grid Connection:** 05 Jan 1992      **Cumulative Load Factor:** 61.9%  
**Date of Commercial Operation:** 01 Jul 1992      **Cumulative Unit Capability Factor:** 71.1%  
**Cumulative Energy Unavailability Factor:** 37.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1992	567.0	201.0	65.2	65.2	64.2	64.2	64.2	64.2	3553	80.5
1993	83.3	200.0	4.8	25.1	4.8	24.7	4.8	24.7	548	6.3
1994	761.7	200.0	53.1	36.3	43.5	32.2	43.5	32.2	5494	62.7
1995	1036.8	200.0	68.6	45.5	66.1	41.9	59.2	39.9	5798	66.2
1996	1227.5	200.0	79.4	53.0	69.9	48.1	69.9	46.6	6572	74.8
1997	1568.7	200.0	91.4	60.0	89.2	55.6	89.5	54.4	8121	92.7
1998	1333.2	200.0	80.1	63.1	75.1	58.6	76.1	57.7	6829	78.0
1999	1425.9	200.0	87.0	66.3	85.8	62.2	81.4	60.9	7468	85.3
2000	1340.8	200.0	80.6	68.0	79.9	64.3	76.3	62.7	7182	81.8
2001	1343.0	200.0	75.4	68.7	74.5	65.4	76.7	64.2	6897	78.7
2002	1692.8	202.0	95.7	71.3	94.8	68.2	95.7	67.2	8416	96.1
2003	1287.1	202.0	85.4	72.6	70.7	68.4	72.7	67.7	7458	85.1
2004	1364.6	202.0	96.7	74.5	78.9	69.2	76.9	68.4	8447	96.2
2005	1222.9	202.0	93.2	75.9	71.5	69.4	69.1	68.5	7907	90.3
2006	1229.4	202.0	94.6	77.2	71.9	69.6	69.5	68.5	8278	94.5
2007	496.8	202.0	54.9	75.8	30.0	67.0	28.1	65.9	4808	54.9
2008	0.0	202.0	-0.3	71.1	-0.3	62.9	0.0	61.9	0	0.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1992 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					529	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling				75		
D. Inspection, maintenance or repair without refuelling				982	1	
E. Testing of plant systems or component				10	23	
F. Major back-fitting, refurbishment or upgrading activities with refuelling	8784			18		
H. Nuclear regulatory requirement				31	27	
J. Grid limitation, failure or grid unavailability					2	100
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					5	
Subtotal	8784	0	0	1116	597	100
Total	8784			1813		

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

System	2008 Hours Lost	1992 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		45
12. Reactor I&C Systems		49
13. Reactor Auxiliary System:		5
15. Reactor Cooling System:		59
16. Steam generation system:		3
17. Safety I&C Systems (excluding reactor I&C)		14
21. Fuel Handling and Storage Facilities		8
31. Turbine and auxiliaries:		186
32. Feedwater and Main Steam System		25
41. Main Generator System:		32
42. Electrical Power Supply System:		73
Total	0	499

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** -0.3%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.3%  
**Total Off-line Time:** 8760 hours

### 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
<b>UCF (%)</b>	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
<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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<b>PUF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<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. 2008 Summary of Operation

THIS UNIT IS SHUTDOWN SINCE 9TH OCTOBER 2004. A VERY THOROUGH TECHNO-ECONOMIC STUDY IS BEING DONE TO TAKE APPROPRIATE DECISION ABOUT ITS FURTHER OPERATION.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Aug 1965	<b>Lifetime Generation:</b>	10138.4 GW(e).h
<b>Date of First Criticality:</b>	11 Aug 1972	<b>Cumulative Energy Availability Factor:</b>	24.3%
<b>Date of Grid Connection:</b>	30 Nov 1972	<b>Cumulative Load Factor:</b>	20.9%
<b>Date of Commercial Operation:</b>	16 Dec 1973	<b>Cumulative Unit Capability Factor:</b>	25.3%
		<b>Cumulative Energy Unavailability Factor:</b>	75.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	55.0	145.0	90.6	90.6	90.6	90.6	51.0	51.0	553	74.3
1974	667.6	207.0	36.8	39.8	36.8	39.8	36.8	37.6	4690	53.5
1975	599.7	206.0	33.2	36.6	33.2	36.6	33.2	35.5	3817	43.6
1976	801.9	206.0	44.3	39.1	44.3	39.1	44.3	38.4	5728	65.2
1977	456.9	206.0	26.4	36.0	26.4	36.0	25.3	35.2	3312	37.8
1978	153.2	206.0	8.5	30.6	8.5	30.6	8.5	29.9	1537	17.5
1979	1147.3	206.0	63.6	36.0	63.6	36.0	63.6	35.5	7217	82.4
1980	953.1	206.0	52.7	38.4	52.7	38.4	52.7	37.9	6346	72.2
1981	441.5	220.0	22.9	36.4	22.9	36.4	22.9	35.9	3732	42.6
1982	38.2	206.0	2.1	32.6	2.1	32.6	2.1	32.2	496	5.7
1983	0.0	202.0	0.0	29.4	0.0	29.4	0.0	29.1	0	0.0
1984	0.0	180.0	0.0	27.1	0.0	27.1	0.0	26.8	0	0.0
1985	226.2	204.0	12.7	25.9	12.7	25.9	12.7	25.6	1914	21.8
1986	0.0	207.0	0.0	23.9	0.0	23.9	0.0	23.6	0	0.0
1987	169.9	207.0	16.6	23.4	9.4	22.9	9.4	22.6	2555	29.2
1988	376.5	207.0	25.3	23.5	20.7	22.7	20.7	22.5	5793	65.9
1989	312.8	207.0	18.7	23.2	17.3	22.4	17.3	22.2	4779	54.6
1990	364.1	192.0	22.3	23.2	19.4	22.2	21.6	22.1	5789	66.1
1991	197.5	192.0	74.8	25.9	74.8	25.0	11.7	21.6	2858	32.6
1992	57.7	84.0	12.2	25.5	12.2	24.7	7.8	21.3	1070	12.2
1993	167.6	84.0	22.8	25.5	22.8	24.6	22.8	21.3	2435	27.8
1994	2.9	84.0	2.2	25.0	2.2	24.1	0.4	20.9	195	2.2
1995	0.0	84.0	0.0	24.5	0.0	23.6	0.0	20.4	0	0.0
1996	0.0	84.0	0.0	24.0	0.0	23.2	0.0	20.0	0	0.0
1997	264.6	84.0	39.2	24.3	31.9	23.3	36.0	20.3	2792	31.9
1998	567.4	134.0	63.8	25.5	62.2	24.5	48.3	21.2	5448	62.2
1999	795.0	134.0	81.0	27.2	73.6	26.0	67.7	22.6	6443	73.6
2000	681.3	134.0	57.5	28.1	57.0	26.9	57.9	23.6	5008	57.0
2001	173.2	134.0	10.5	27.6	10.0	26.4	14.8	23.4	860	9.8
2002	0.0	90.0	0.0	27.0	0.0	25.9	0.0	22.9	0	0.0
2003	0.0	134.0	0.0	26.3	0.0	25.2	0.0	22.3	0	0.0
2004	303.8	134.0	56.8	27.1	56.8	26.1	25.8	22.4	3785	43.1
2005	0.0	90.0	0.0	26.6	0.0	25.6	0.0	22.0	0	0.0
2006	0.0	90.0	0.0	26.2	0.0	25.2	0.0	21.6	0	0.0
2007	0.0	90.0	0.0	25.7	0.0	24.8	0.0	21.3	0	0.0
2008	0.0	90.0	-0.3	25.3	-0.3	24.3	0.0	20.9	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1973 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				137	2250	
B. Refuelling without a maintenance outage					34	
D. Inspection, maintenance or repair without refuelling				2482		
E. Testing of plant systems or component					6	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				34	19	
H. Nuclear regulatory requirement				287		
J. Grid limitation, failure or grid unavailability					2	99
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				15		44
Z. Others	8784			486		
Subtotal	8784	0	0	3441	2311	143
Total	8784			5895		

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

System	2008 Hours Lost	1973 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1113
12. Reactor I&C Systems		155
13. Reactor Auxiliary Systems		51
14. Safety Systems		29
15. Reactor Cooling Systems		385
16. Steam generation systems		5
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		423
32. Feedwater and Main Steam System		10
41. Main Generator Systems		90
42. Electrical Power Supply Systems		99
XX. Miscellaneous Systems		6
Total	0	2367

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** -0.3%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.3%  
**Total Off-line Time:** 8760 hours

### 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
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. 2008 Summary of Operation

THIS UNIT IS SHUTDOWN SINCE 2ND JULY 2007 FOR EN-MASSE FEEDER REPLACEMENT WORK. THIS WORK HAS BEEN COMPLETED. SYSTEM UPGRADATION AND NORMALIZATION WORK IS IN PROGRESS.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Apr 1968	<b>Lifetime Generation:</b>	21754.0 GW(e).h
<b>Date of First Criticality:</b>	08 Oct 1980	<b>Cumulative Energy Availability Factor:</b>	54.3%
<b>Date of Grid Connection:</b>	01 Nov 1980	<b>Cumulative Load Factor:</b>	50.9%
<b>Date of Commercial Operation:</b>	01 Apr 1981	<b>Cumulative Unit Capability Factor:</b>	57.7%
		<b>Cumulative Energy Unavailability Factor:</b>	45.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	551.9	220.0	38.4	38.4	38.4	38.4	38.0	38.0	5316	80.5
1982	372.9	206.0	20.7	28.6	20.7	28.6	20.7	28.4	3651	41.7
1983	957.2	202.0	54.1	37.6	54.1	37.6	54.1	37.4	6673	76.2
1984	908.7	185.0	56.1	42.1	49.1	40.4	55.9	42.0	5870	66.8
1985	959.9	184.0	73.3	48.2	71.3	46.4	59.6	45.4	6243	71.3
1986	1080.5	207.0	65.2	51.3	59.6	48.8	59.6	47.9	6743	77.0
1987	1031.1	207.0	63.2	53.1	56.9	50.0	56.9	49.3	6277	71.7
1988	1234.0	207.0	70.1	55.3	67.9	52.4	67.9	51.8	7935	90.3
1989	1084.2	207.0	60.5	55.9	59.8	53.3	59.8	52.7	6980	79.7
1990	1173.8	192.0	68.7	57.2	68.7	54.8	69.8	54.4	7151	81.6
1991	895.1	192.0	62.9	57.7	62.9	55.5	53.2	54.3	5416	61.8
1992	874.4	184.0	90.3	60.3	58.1	55.7	54.1	54.3	5297	60.3
1993	1153.5	184.0	74.2	61.3	71.1	56.8	71.6	55.5	6983	79.7
1994	519.4	184.0	39.4	59.8	32.2	55.2	32.2	53.9	3244	37.0
1995	0.0	184.0	0.0	56.0	0.0	51.6	0.0	50.5	0	0.0
1996	0.0	184.0	0.0	52.6	0.0	48.5	0.0	47.5	0	0.0
1997	0.0	184.0	0.0	49.7	0.0	45.8	0.0	44.8	0	0.0
1998	512.4	184.0	49.6	49.7	49.6	46.0	31.8	44.1	3728	42.6
1999	1162.3	184.0	87.6	51.6	83.1	47.9	72.1	45.5	7264	82.9
2000	1308.1	184.0	92.3	53.6	92.3	50.0	80.9	47.2	8104	92.3
2001	1348.3	184.0	86.9	55.1	85.5	51.7	83.6	48.9	7486	85.5
2002	1430.9	187.0	90.7	56.7	89.0	53.3	87.3	50.6	7768	88.7
2003	1391.5	187.0	92.3	58.2	84.7	54.7	84.9	52.1	8018	91.5
2004	1047.7	187.0	77.8	59.0	77.8	55.6	63.8	52.6	6806	77.5
2005	1134.8	187.0	80.5	59.9	80.0	56.6	69.3	53.2	7581	86.5
2006	1026.8	187.0	75.9	60.5	70.4	57.1	62.7	53.6	7207	82.3
2007	508.7	187.0	42.4	59.8	34.0	56.3	31.1	52.8	3758	42.9
2008	0.0	187.0	-0.3	57.7	-0.3	54.3	0.0	50.9	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					779	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling				99		
D. Inspection, maintenance or repair without refuelling				1416	2	
E. Testing of plant systems or component					13	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	8784			152		15
H. Nuclear regulatory requirement				126	2	1
J. Grid limitation, failure or grid unavailability					28	169
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				46	20	2
P. Fire					4	
Z. Others					24	2
Subtotal	8784	0	0	1839	877	189
Total	8784			2905		

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		44
12. Reactor I&C Systems		145
13. Reactor Auxiliary System:		14
14. Safety Systems		26
15. Reactor Cooling System:		90
16. Steam generation system:		11
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		246
32. Feedwater and Main Steam System		40
35. All other I&C Systems		14
41. Main Generator System:		63
42. Electrical Power Supply System:		53
XX. Miscellaneous Systems		11
Total	0	758

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 952.9 GW(e).h  
**Energy Availability Factor:** 61.7%  
**Load Factor:** 53.9%  
**Operating Factor:** 88.0%  
**Energy Unavailability Factor:** 38.3%  
**Total Off-line Time:** 1053 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	100.9	94.0	99.3	85.6	81.7	77.4	80.2	56.6	0.0	82.4	91.3	103.4	952.9
<b>EAF (%)</b>	70.3	69.2	70.3	70.3	70.3	70.3	70.3	50.2	1.0	61.5	65.8	70.3	61.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.4	1.0	87.4	93.5	100.0	87.8
<b>LF (%)</b>	67.2	69.3	66.1	59.0	54.4	53.2	53.4	37.7	0.0	54.7	62.8	68.8	53.9
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	71.1	0.0	87.1	93.5	100.0	88.0
<b>EUF (%)</b>	29.7	30.8	29.7	29.7	29.7	29.7	29.7	49.8	99.0	38.5	34.2	29.7	38.3
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.6	99.0	12.6	0.0	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	6.5	0.0	0.5
<b>XUF (%)</b>	29.7	30.8	29.7	29.7	29.7	29.7	29.7	21.1	0.0	25.9	27.8	29.7	26.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THIS UNIT ACHIEVED ANNUAL AVAILABILITY FACTOR OF 87.65%. IN THIS YEAR BIENNIAL SHUTDOWN WAS TAKEN FOR 43 DAYS.

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1990      **Lifetime Generation:** 12010.0 GW(e).h  
**Date of First Criticality:** 24 Dec 1999      **Cumulative Energy Availability Factor:** 72.9%  
**Date of Grid Connection:** 10 Mar 2000      **Cumulative Load Factor:** 70.2%  
**Date of Commercial Operation:** 01 Jun 2000      **Cumulative Unit Capability Factor:** 88.1%  
**Cumulative Energy Unavailability Factor:** 27.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2000	797.7	200.0	76.4	76.4	76.4	76.4	77.6	77.6	3986	77.6
2001	1366.1	200.0	84.9	81.7	83.6	80.9	78.0	77.8	7317	83.5
2002	1317.9	202.0	81.2	81.5	75.5	78.8	74.5	76.5	6715	76.7
2003	1442.1	202.0	95.3	85.4	84.5	80.4	81.5	77.9	8285	94.6
2004	1260.3	202.0	90.0	86.4	72.3	78.6	71.0	76.4	7711	87.8
2005	1487.9	202.0	98.3	88.5	84.6	79.7	84.1	77.8	8581	98.0
2006	985.6	202.0	83.8	87.8	57.8	76.4	55.7	74.4	7323	83.6
2007	1043.0	202.0	90.7	88.2	61.1	74.4	58.9	72.4	7934	90.6
2008	952.9	202.0	87.8	88.1	61.7	72.9	53.9	70.2	7707	88.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2000 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		46			552	
D. Inspection, maintenance or repair without refuelling	1030			318		
E. Testing of plant systems or component:					54	
J. Grid limitation, failure or grid unavailability						69
L. Human factor related					13	
Subtotal	1030	46	0	318	619	69
Total		1076			1006	

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

System	2008 Hours Lost	2000 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	46	129
13. Reactor Auxiliary System:		55
15. Reactor Cooling System:		40
16. Steam generation system:		45
31. Turbine and auxiliaries		72
32. Feedwater and Main Steam System		86
41. Main Generator System:		34
42. Electrical Power Supply System:		55
XX. Miscellaneous Systems		6
Total	46	522

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 1041.6 GW(e).h  
**Energy Availability Factor:** 69.0%  
**Load Factor:** 58.9%  
**Operating Factor:** 98.5%  
**Energy Unavailability Factor:** 31.0%  
**Total Off-line Time:** 134 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	86.1	80.0	81.7	94.9	76.7	96.1	99.3	89.9	80.1	84.1	83.8	88.8	1041.6
<b>EAF (%)</b>	70.3	69.2	70.3	70.3	55.5	70.3	70.3	70.3	70.3	70.3	70.3	70.3	69.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	78.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.2
<b>LF (%)</b>	57.3	58.9	54.4	65.3	51.0	66.1	66.1	59.8	55.1	55.9	57.6	59.1	58.9
<b>OF (%)</b>	100.0	103.6	100.0	100.1	78.8	100.0	100.0	100.0	100.0	99.9	100.0	100.0	98.5
<b>EUF (%)</b>	29.7	30.8	29.7	29.7	44.5	29.7	29.7	29.7	29.7	29.7	29.7	29.7	31.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	21.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8
<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>	29.7	30.8	29.7	29.7	23.4	29.7	29.7	29.7	29.7	29.7	29.7	29.7	29.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THIS UNIT ACHIEVED AN ANNUAL AVAILABILITY FACTOR OF 98.23%.

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1990      **Lifetime Generation:** 11418.2 GW(e).h  
**Date of First Criticality:** 03 Nov 2000      **Cumulative Energy Availability Factor:** 73.5%  
**Date of Grid Connection:** 17 Nov 2000      **Cumulative Load Factor:** 71.8%  
**Date of Commercial Operation:** 23 Dec 2000      **Cumulative Unit Capability Factor:** 90.8%  
**Cumulative Energy Unavailability Factor:** 26.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2000	54.9	200.0	54.8	54.8	54.8	54.8	36.9	36.9	410	55.1
2001	1200.8	200.0	82.0	79.9	71.0	69.7	68.5	66.1	6214	70.9
2002	1671.5	202.0	96.5	87.9	94.3	81.6	94.5	79.8	8255	94.2
2003	1318.2	202.0	87.6	87.8	74.8	79.4	74.5	78.0	7633	87.1
2004	1447.7	202.0	95.8	89.7	79.5	79.4	81.6	78.9	8329	94.8
2005	1461.9	202.0	92.8	90.3	82.3	80.0	82.6	79.6	8074	92.2
2006	1128.1	202.0	95.2	91.1	64.1	77.4	63.8	77.0	8334	95.1
2007	943.4	202.0	81.2	89.7	54.7	74.2	53.3	73.7	7101	81.1
2008	1041.6	202.0	98.2	90.8	69.0	73.5	58.9	71.8	8626	98.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2000 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				27	290	
D. Inspection, maintenance or repair without refuelling	158			244		
J. Grid limitation, failure or grid unavailability						117
Subtotal	158	0	0	271	290	117
Total	158			678		

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

System	2008 Hours Lost	2000 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		45
15. Reactor Cooling System:		70
16. Steam generation system:		20
21. Fuel Handling and Storage Facilities		19
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		45
41. Main Generator System:		17
42. Electrical Power Supply System:		72
Total	0	314

## 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**  
**at the beginning of 2008:** 150.0 MW(e)  
**Design Net Capacity:** 200.0 MW(e)  
**Design Discharge Burnup:** 21000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 964.8 GW(e).h  
**Energy Availability Factor:** 78.1%  
**Load Factor:** 73.4%  
**Operating Factor:** 80.4%  
**Energy Unavailability Factor:** 21.9%  
**Total Off-line Time:** 1715 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	89.0	101.8	106.7	103.9	90.0	92.4	104.6	99.9	74.8	93.6	8.1	0.0	964.8
<b>EAF (%)</b>	83.2	100.0	100.0	100.0	87.7	92.5	100.0	100.0	88.1	84.0	3.4	0.0	78.1
<b>UCF (%)</b>	83.2	100.0	100.0	100.0	87.7	100.0	100.0	100.0	88.1	100.0	3.4	0.0	80.1
<b>LF (%)</b>	79.7	101.0	95.6	96.4	80.7	85.6	93.7	89.5	69.2	83.8	7.5	0.0	73.4
<b>OF (%)</b>	83.2	103.6	100.0	100.1	91.1	93.8	100.0	100.0	84.7	99.9	9.9	0.0	80.4
<b>EUF (%)</b>	16.8	0.0	0.0	0.0	12.3	7.5	0.0	0.0	11.9	16.0	96.6	100.0	21.9
<b>PUF (%)</b>	16.8	0.0	0.0	0.0	12.3	0.0	0.0	0.0	11.9	0.0	96.6	100.0	19.9
<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	7.5	0.0	0.0	0.0	16.0	0.0	0.0	2.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

IN THIS YEAR UNIT ACHIEVED A CAPACITY FACTOR OF 73.99% AND AVAILABILITY FACTOR OF 80.2%.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Oct 1964	<b>Lifetime Generation:</b>	34957.1 GW(e).h
<b>Date of First Criticality:</b>	01 Feb 1969	<b>Cumulative Energy Availability Factor:</b>	68.8%
<b>Date of Grid Connection:</b>	01 Apr 1969	<b>Cumulative Load Factor:</b>	56.6%
<b>Date of Commercial Operation:</b>	28 Oct 1969	<b>Cumulative Unit Capability Factor:</b>	69.5%
		<b>Cumulative Energy Unavailability Factor:</b>	31.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1969	0.0	210.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1970	0.0	210.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1971	0.0	210.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1972	652.4	210.0	35.4	80.1	35.4	80.1	35.4	10.9	5071	57.7
1973	757.1	210.0	41.2	70.9	41.2	70.9	41.2	18.0	5181	59.1
1974	832.6	156.0	60.5	69.4	60.5	69.4	60.9	24.4	6938	79.2
1975	926.6	200.0	53.0	66.8	53.0	66.8	52.9	28.9	5825	66.5
1976	1156.6	210.0	62.7	66.2	62.7	66.2	62.7	33.8	7617	86.7
1977	994.8	210.0	54.1	64.7	54.1	64.7	54.1	36.4	6675	76.2
1978	941.0	210.0	51.2	63.1	51.2	63.1	51.2	38.0	6427	73.4
1979	965.9	210.0	52.5	62.1	52.5	62.1	52.5	39.5	7143	81.5
1980	893.9	210.0	67.8	62.6	67.8	62.6	48.5	40.3	5955	67.8
1981	793.8	210.0	68.4	63.1	68.4	63.1	43.2	40.5	5986	68.3
1982	1112.2	210.0	89.9	65.2	89.9	65.2	60.5	42.1	7872	89.9
1983	730.0	200.0	41.7	63.5	41.7	63.5	41.7	42.0	5396	61.6
1984	826.9	200.0	90.3	65.3	89.6	65.2	47.1	42.4	7688	87.5
1985	790.9	170.0	64.6	65.2	64.6	65.2	53.2	42.9	6194	70.7
1986	1090.2	150.0	84.6	66.1	83.0	66.0	83.0	44.7	7954	90.8
1987	193.4	150.0	14.7	63.9	14.7	63.8	14.7	43.4	1533	17.5
1988	1085.5	150.0	83.8	64.7	82.4	64.6	82.4	45.0	8010	91.2
1989	800.3	150.0	61.6	64.6	61.4	64.4	60.9	45.6	6177	70.5
1990	1045.2	150.0	80.5	65.2	80.2	65.0	79.5	46.9	7772	88.7
1991	566.9	150.0	82.4	65.8	80.4	65.6	43.1	46.7	6536	74.6
1992	762.3	150.0	58.7	65.6	57.9	65.3	57.9	47.1	5487	62.5
1993	967.7	150.0	76.9	65.9	74.4	65.6	73.6	48.0	7291	83.2
1994	280.6	150.0	22.9	64.6	21.4	64.2	21.4	47.1	2450	28.0
1995	1092.3	150.0	91.0	65.4	83.1	64.8	83.1	48.3	7893	90.1
1996	403.3	150.0	32.3	64.4	30.6	63.7	30.6	47.7	3872	44.1
1997	985.5	150.0	75.9	64.7	75.0	64.1	75.0	48.5	7347	83.9
1998	1162.6	150.0	92.8	65.5	91.6	64.9	88.5	49.7	8283	94.6
1999	852.6	150.0	67.9	65.6	67.0	64.9	64.9	50.1	6405	73.1
2000	1181.1	150.0	91.6	66.3	91.6	65.6	89.6	51.2	8337	94.9
2001	1084.2	150.0	84.3	66.8	83.6	66.1	82.5	52.0	7635	87.2
2002	1180.7	150.0	93.8	67.5	92.0	66.8	89.9	53.0	8394	95.8
2003	1100.4	150.0	86.9	67.9	85.2	67.2	83.7	53.7	7901	90.2
2004	1148.6	150.0	90.9	68.5	89.0	67.8	87.2	54.6	8111	92.3
2005	965.0	150.0	74.2	68.6	74.2	67.9	73.4	55.0	6552	74.8
2006	938.7	150.0	71.9	68.7	71.4	68.0	71.4	55.4	6652	75.9
2007	1218.3	150.0	93.6	69.3	92.7	68.6	92.7	56.2	8400	95.9
2008	964.8	150.0	80.1	69.5	78.1	68.8	73.4	56.6	7045	80.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					332	1
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1396			1310	19	
D. Inspection, maintenance or repair without refuelling	277			210	0	
E. Testing of plant systems or component				8		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				87		
J. Grid limitation, failure or grid unavailability			45		0	48
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	2	3
Subtotal	1673	0	45	1615	353	52
Total	1718			2020		

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		12
13. Reactor Auxiliary Systems		1
14. Safety Systems		1
15. Reactor Cooling Systems		56
16. Steam generation system		18
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		156
32. Feedwater and Main Steam System		48
41. Main Generator Systems		0
42. Electrical Power Supply Systems		32
XX. Miscellaneous Systems		0
Total	0	328

## 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**  
**at the beginning of 2008:** 150.0 MW(e)  
**Design Net Capacity:** 200.0 MW(e)  
**Design Discharge Burnup:** 21000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 1265.0 GW(e).h  
**Energy Availability Factor:** 95.8%  
**Load Factor:** 96.3%  
**Operating Factor:** 96.6%  
**Energy Unavailability Factor:** 4.2%  
**Total Off-line Time:** 298 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	114.1	108.5	106.7	110.5	110.8	101.2	111.5	113.9	87.9	103.2	109.9	86.7	1265.0
<b>EAF (%)</b>	100.0	100.0	89.4	100.0	100.0	96.3	100.0	100.0	88.5	96.2	100.0	79.7	95.8
<b>UCF (%)</b>	100.0	100.0	92.7	100.0	100.0	100.0	100.0	100.0	100.0	96.2	100.0	79.7	97.3
<b>LF (%)</b>	102.3	107.6	95.6	102.5	99.3	93.7	99.9	102.1	81.4	92.4	101.7	77.7	96.3
<b>OF (%)</b>	100.0	103.6	90.1	100.1	100.0	96.5	100.0	100.0	92.6	96.1	100.0	80.9	96.6
<b>EUF (%)</b>	0.0	0.0	10.6	0.0	0.0	3.7	0.0	0.0	11.5	3.8	0.0	20.3	4.2
<b>PUF (%)</b>	0.0	0.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	20.3	2.7
<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	3.3	0.0	0.0	3.7	0.0	0.0	11.5	0.0	0.0	0.0	1.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

UNIT ACHIEVED A CAPACITY FACTOR OF 96.06% AND AVAILABILITY FACTOR OF 96.29%.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Oct 1964	<b>Lifetime Generation:</b>	35399.6 GW(e).h
<b>Date of First Criticality:</b>	28 Feb 1969	<b>Cumulative Energy Availability Factor:</b>	67.8%
<b>Date of Grid Connection:</b>	05 May 1969	<b>Cumulative Load Factor:</b>	56.8%
<b>Date of Commercial Operation:</b>	28 Oct 1969	<b>Cumulative Unit Capability Factor:</b>	68.5%
		<b>Cumulative Energy Unavailability Factor:</b>	32.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1969	0.0	210.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1970	0.0	210.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1971	0.0	210.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1972	218.0	210.0	11.8	72.8	11.8	72.8	11.8	3.6	1987	22.6
1973	1249.6	210.0	67.9	71.7	67.9	71.7	67.9	18.7	7402	84.5
1974	597.0	194.0	35.2	65.2	35.0	65.1	35.1	21.7	4016	45.8
1975	925.8	200.0	52.8	63.2	52.8	63.2	52.8	26.5	5654	64.5
1976	1137.9	210.0	61.7	63.0	61.7	63.0	61.7	31.5	6534	74.4
1977	1161.5	210.0	68.2	63.7	68.2	63.6	63.1	35.4	7650	87.3
1978	1146.1	210.0	62.3	63.5	62.3	63.5	62.3	38.3	6678	76.2
1979	993.0	210.0	53.9	62.6	53.9	62.6	54.0	39.8	6216	71.0
1980	899.9	210.0	78.4	64.0	78.4	64.0	48.8	40.7	6883	78.4
1981	964.0	210.0	77.1	65.1	77.1	65.1	52.4	41.6	6748	77.0
1982	556.7	210.0	55.4	64.3	55.4	64.3	30.3	40.8	4844	55.3
1983	867.7	200.0	49.5	63.3	49.5	63.3	49.5	41.4	7519	85.8
1984	803.1	200.0	70.6	63.8	69.6	63.7	45.7	41.6	5615	63.9
1985	1070.9	170.0	83.4	64.8	83.4	64.7	72.0	43.2	8059	92.0
1986	769.5	150.0	58.9	64.5	58.6	64.5	58.6	43.8	5615	64.1
1987	1167.2	150.0	91.5	65.7	88.8	65.5	88.8	45.7	8221	93.8
1988	813.5	150.0	62.1	65.5	61.7	65.3	61.7	46.3	6077	69.2
1989	427.1	150.0	34.8	64.3	34.8	64.2	32.5	45.8	3052	34.8
1990	762.4	150.0	58.7	64.1	58.7	64.0	58.0	46.3	7827	89.3
1991	848.5	150.0	76.4	64.6	75.0	64.3	64.6	46.9	6265	71.5
1992	819.8	150.0	62.8	64.5	62.2	64.3	62.2	47.4	6076	69.2
1993	779.7	150.0	60.7	64.4	59.3	64.1	59.3	47.8	5750	65.6
1994	843.6	150.0	64.9	64.4	64.2	64.1	64.2	48.4	6722	76.7
1995	640.0	150.0	55.6	64.1	48.7	63.6	48.7	48.4	4911	56.1
1996	361.2	150.0	30.4	63.1	27.4	62.5	27.4	47.7	3203	36.5
1997	775.7	150.0	59.6	63.0	59.0	62.4	59.0	48.1	6978	79.7
1998	881.1	150.0	71.2	63.2	67.8	62.6	67.1	48.6	6522	74.5
1999	1103.5	150.0	87.6	63.9	86.4	63.2	84.0	49.6	7711	88.0
2000	1023.1	150.0	79.0	64.3	79.0	63.7	77.6	50.3	7162	81.5
2001	1197.4	150.0	93.9	65.1	93.3	64.4	91.1	51.4	8364	95.5
2002	1163.3	150.0	90.8	65.7	90.2	65.1	88.5	52.3	7978	91.1
2003	1117.1	150.0	86.1	66.3	85.9	65.6	85.0	53.2	7890	90.1
2004	1238.3	150.0	95.2	67.0	94.5	66.3	94.0	54.2	8455	96.3
2005	893.3	150.0	70.7	67.0	68.9	66.4	68.0	54.5	6359	72.6
2006	1090.9	150.0	83.9	67.4	82.7	66.8	83.0	55.1	7439	84.9
2007	1142.4	150.0	87.2	67.9	86.5	67.2	86.9	55.9	7812	89.2
2008	1265.0	150.0	97.3	68.5	95.8	67.8	96.3	56.8	8462	96.6



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					543	2
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling				1313		
D. Inspection, maintenance or repair without refuelling	220			196		
E. Testing of plant systems or component				2	4	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				59		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				30		
H. Nuclear regulatory requirement					6	
J. Grid limitation, failure or grid unavailability			103			36
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	14
Subtotal	220	0	103	1600	555	52
Total		323			2207	

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems		4
13. Reactor Auxiliary System		47
14. Safety Systems		4
15. Reactor Cooling System		78
16. Steam generation system		15
31. Turbine and auxiliaries		67
32. Feedwater and Main Steam System		61
41. Main Generator System		107
42. Electrical Power Supply System		116
XX. Miscellaneous Systems		12
Total	0	530

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 1594.4 GW(e).h  
**Energy Availability Factor:** 44.2%  
**Load Factor:** 37.1%  
**Operating Factor:** 85.2%  
**Energy Unavailability Factor:** 55.8%  
**Total Off-line Time:** 1295 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	156.8	153.0	125.2	12.7	63.9	122.0	160.2	160.6	153.2	163.3	159.0	164.5	1594.4
<b>EAF (%)</b>	50.8	50.9	41.6	5.8	22.4	42.5	52.2	52.4	51.6	53.1	53.3	53.4	44.2
<b>UCF (%)</b>	98.1	100.0	80.6	11.8	44.3	92.0	99.6	100.0	100.0	100.0	100.0	100.0	85.5
<b>LF (%)</b>	43.0	46.5	34.3	3.6	17.5	34.6	43.9	44.1	43.4	44.7	45.1	45.1	37.1
<b>OF (%)</b>	98.1	103.6	80.6	12.0	44.4	84.7	99.6	100.0	100.0	99.9	100.0	100.0	85.2
<b>EUF (%)</b>	49.2	49.1	58.4	94.2	77.6	57.5	47.8	47.6	48.4	46.9	46.7	46.6	55.8
<b>PUF (%)</b>	0.0	0.0	0.0	88.2	51.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6
<b>UCLF (%)</b>	1.9	0.0	19.4	0.0	4.4	8.0	0.4	0.0	0.0	0.0	0.0	0.0	2.9
<b>XUF (%)</b>	47.3	49.1	39.0	5.9	22.0	49.5	47.4	47.6	48.4	46.9	46.7	46.6	41.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

UNIT ACHIEVED AN AVAILABILITY FACTOR OF 84.98% IN YEAR 2008. IN THIS YEAR BIENNIAL SHUTDOWN OF THE UNIT WAS TAKEN FOR ABOUT 40 DAYS. THIS UNIT CROSSED ITS EARLIER CONTINUOUS OPERATION OF 188 DAYS.

### 5. Historical Summary

**Date of Construction Start:** 12 May 2000 **Lifetime Generation:** 5106.2 GW(e).h  
**Date of First Criticality:** 21 May 2006 **Cumulative Energy Availability Factor:** 53.9%  
**Date of Grid Connection:** 15 Jun 2006 **Cumulative Load Factor:** 48.0%  
**Date of Commercial Operation:** 18 Aug 2006 **Cumulative Unit Capability Factor:** 84.9%  
**Cumulative Energy Unavailability Factor:** 46.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2006	909.1	490.0	66.0	66.0	47.5	47.5	50.5	50.5	2523	68.7
2007	2482.8	490.0	92.1	84.4	66.2	60.7	57.8	55.7	7967	90.9
2008	1594.4	490.0	85.5	84.9	44.2	53.9	37.1	48.0	7465	85.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2006 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		179			616	
D. Inspection, maintenance or repair without refuelling	1015					
J. Grid limitation, failure or grid unavailability			51			34
L. Human factor related		57				
P. Fire		13			3	
Subtotal	1015	249	51	0	619	34
Total		1315			653	

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

System	2008 Hours Lost	2006 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	135	160
15. Reactor Cooling Systems		139
31. Turbine and auxiliaries		227
32. Feedwater and Main Steam System	41	34
41. Main Generator Systems	2	54
Total	178	614

## 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 1709.8 GW(e).h  
**Energy Availability Factor:** 47.2%  
**Load Factor:** 39.8%  
**Operating Factor:** 91.6%  
**Energy Unavailability Factor:** 52.8%  
**Total Off-line Time:** 738 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	158.0	150.3	158.9	103.7	152.7	96.5	159.8	160.8	157.0	162.8	140.9	108.3	1709.8
<b>EAF (%)</b>	51.2	50.3	51.6	36.0	50.3	33.6	51.9	52.3	52.5	52.8	47.6	36.4	47.2
<b>UCF (%)</b>	100.0	100.0	100.0	71.3	100.0	65.1	100.0	100.0	100.0	100.0	89.2	69.6	91.3
<b>LF (%)</b>	43.3	45.7	43.6	29.4	41.9	27.4	43.8	44.1	44.5	44.6	39.9	29.7	39.8
<b>OF (%)</b>	100.0	103.6	100.0	71.3	100.0	65.1	100.0	100.0	100.0	99.9	89.2	69.6	91.6
<b>EUf (%)</b>	48.8	49.7	48.4	64.0	49.7	66.4	48.1	47.7	47.5	47.2	52.4	63.6	52.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	34.9	0.0	0.0	0.0	0.0	0.0	0.0	2.9
<b>UCLF (%)</b>	0.0	0.0	0.0	28.7	0.0	0.0	0.0	0.0	0.0	0.0	10.8	30.4	5.8
<b>XUF (%)</b>	48.8	49.7	48.4	35.3	49.7	31.5	48.1	47.7	47.5	47.2	41.7	33.2	44.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THUS UNIT ACHIEVED AN AVAILABILITY FACTOR OF 91.33% DURING THE YEAR. IN THIS YEAR THE UNIT OPERATED CONTINUOUSLY FOR 151 DAYS.

### 5. Historical Summary

**Date of Construction Start:** 08 Mar 2000 **Lifetime Generation:** 6507.3 GW(e).h  
**Date of First Criticality:** 06 Mar 2005 **Cumulative Energy Availability Factor:** 49.6%  
**Date of Grid Connection:** 04 Jun 2005 **Cumulative Load Factor:** 45.0%  
**Date of Commercial Operation:** 12 Sep 2005 **Cumulative Unit Capability Factor:** 78.3%  
**Cumulative Energy Unavailability Factor:** 50.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2005	942.8	490.0	77.4	77.4	73.8	73.8	65.7	65.7	2227	76.0
2006	1762.1	490.0	65.2	68.3	39.0	47.7	41.1	47.2	5454	62.3
2007	2033.0	490.0	78.5	72.7	54.4	50.6	47.4	47.3	6797	77.6
2008	1709.8	490.0	91.3	78.3	47.2	49.6	39.8	45.0	8022	91.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2005 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		510			970	
D. Inspection, maintenance or repair without refuelling	251			375		
E. Testing of plant systems or component				0	124	
G. Major back-fitting, refurbishment or upgrading activities without refuelling	179					
J. Grid limitation, failure or grid unavailability						117
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.						104
Z. Others					13	
Subtotal	251	510	0	554	1107	221
Total		761			1882	

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

System	2008 Hours Lost	2005 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems	206	384
15. Reactor Cooling Systems		31
21. Fuel Handling and Storage Facilities		13
31. Turbine and auxiliaries	42	20
32. Feedwater and Main Steam System		2
33. Circulating Water System	261	
35. All other I&C Systems		0
41. Main Generator Systems		283
42. Electrical Power Supply Systems		184
XX. Miscellaneous Systems		31
Total	509	967

# JP-5 FUKUSHIMA-DAIICHI-1

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

**Contractor:** GE/GETSC (GENERAL ELECTRIC CO. / GENERAL ELECTRIC TECHNICAL SERVICES CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 439.0 MW(e)  
**Design Net Capacity:** 439.0 MW(e)  
**Design Discharge Burnup:** 39500 MW.d/t  
**Status at end of year:** Operational

## 2. Production Summary 2008

**Net Energy Production:** 3036.6 GW(e).h  
**Energy Availability Factor:** 79.2%  
**Load Factor:** 79.0%  
**Operating Factor:** 79.7%  
**Energy Unavailability Factor:** 20.8%  
**Total Off-line Time:** 1776 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	324.9	303.7	324.9	314.1	323.8	314.8	324.4	321.7	310.9	173.4	0.0	0.0	3036.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.1	98.9	54.1	0.0	0.0	79.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.9	100.0	54.4	0.0	0.0	79.4
<b>LF (%)</b>	99.5	103.0	99.5	99.5	99.1	99.6	99.3	98.5	98.4	53.0	0.0	0.0	79.0
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	54.8	0.0	0.0	79.7
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	1.1	45.9	100.0	100.0	20.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	45.6	100.0	80.6	19.0
<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	19.4	1.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.1	0.4	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	25 Jul 1967	<b>Lifetime Generation:</b>	76892.0 GW(e).h
<b>Date of First Criticality:</b>	10 Oct 1970	<b>Cumulative Energy Availability Factor:</b>	53.6%
<b>Date of Grid Connection:</b>	17 Nov 1970	<b>Cumulative Load Factor:</b>	52.9%
<b>Date of Commercial Operation:</b>	26 Mar 1971	<b>Cumulative Unit Capability Factor:</b>	53.6%
		<b>Cumulative Energy Unavailability Factor:</b>	46.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1971	1941.0	460.0	61.5	61.5	61.5	61.5	57.5	57.5	4738	64.5
1972	2589.1	460.0	66.4	64.2	66.4	64.2	64.1	61.1	5878	66.9
1973	2216.8	460.0	58.9	62.3	58.9	62.3	55.0	58.9	5469	62.4
1974	1629.7	439.0	47.0	58.5	47.0	58.5	42.4	54.8	4934	56.3
1975	0.0	439.0	0.0	46.7	0.0	46.7	0.0	43.8	5	0.1
1976	1563.9	439.0	40.5	45.7	40.5	45.7	40.6	43.2	4548	51.8
1977	0.0	439.0	0.0	39.1	0.0	39.1	0.0	37.0	0	0.0
1978	1497.6	439.0	38.9	39.1	38.9	39.1	38.9	37.3	4461	50.9
1979	2504.4	439.0	65.1	42.0	65.1	42.0	65.1	40.4	6626	75.6
1980	1249.5	439.0	32.4	41.1	32.4	41.1	32.4	39.6	3323	37.8
1981	1084.8	439.0	28.1	39.9	28.1	39.9	28.2	38.5	2915	33.3
1982	2355.0	439.0	61.0	41.6	61.0	41.6	61.2	40.4	5741	65.5
1983	3019.5	439.0	78.5	44.5	78.5	44.5	78.5	43.4	7384	84.3
1984	2669.8	439.0	69.5	46.3	69.5	46.3	69.2	45.2	6222	70.8
1985	1699.3	439.0	44.4	46.2	44.4	46.2	44.2	45.2	4005	45.7
1986	2524.7	439.0	66.1	47.4	66.1	47.4	65.7	46.4	5836	66.6
1987	3308.9	439.0	87.8	49.8	87.3	49.7	86.0	48.8	7727	88.2
1988	2794.5	439.0	72.8	51.1	72.8	51.0	72.5	50.1	6431	73.2
1989	1440.8	439.0	38.6	50.4	38.6	50.4	37.5	49.4	3457	39.5
1990	2352.4	439.0	61.4	51.0	61.4	50.9	61.2	50.0	5487	62.6
1991	1280.0	439.0	33.4	50.1	33.4	50.1	33.3	49.2	2985	34.1
1992	1794.1	439.0	46.9	50.0	46.9	49.9	46.5	49.1	4166	47.4
1993	2500.7	439.0	65.5	50.7	65.4	50.6	65.0	49.8	5811	66.3
1994	3337.5	439.0	87.2	52.2	87.2	52.1	86.8	51.3	7667	87.5
1995	3030.8	439.0	79.3	53.3	79.3	53.2	78.8	52.4	6977	79.6
1996	2298.6	439.0	60.0	53.5	60.0	53.5	59.6	52.7	5276	60.1
1997	3258.9	439.0	85.0	54.7	85.0	54.7	84.7	53.9	7445	85.0
1998	3287.2	439.0	86.2	55.8	85.9	55.8	85.5	55.0	7581	86.5
1999	2556.9	439.0	67.0	56.2	67.0	56.2	66.5	55.4	5876	67.1
2000	3706.3	439.0	96.9	57.6	96.9	57.5	96.1	56.8	8517	97.0
2001	487.5	439.0	12.9	56.1	12.9	56.1	12.7	55.4	1131	12.9
2002	3120.2	439.0	81.6	56.9	81.6	56.9	81.1	56.2	7146	81.6
2003	0.0	439.0	0.0	55.2	0.0	55.2	0.0	54.5	0	0.0
2004	0.0	439.0	0.0	53.6	0.0	53.5	0.0	52.9	0	0.0
2005	851.3	439.0	22.6	52.7	22.6	52.7	22.1	52.0	2050	23.4
2006	3714.6	439.0	97.2	53.9	97.1	53.9	96.6	53.2	8664	98.9
2007	610.8	439.0	15.9	52.9	15.9	52.9	15.9	52.2	1412	16.1
2008	3036.6	439.0	79.4	53.6	79.2	53.6	79.0	52.9	6984	79.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		144			661	
C. Inspection, maintenance or repair combined with refuelling	1656			2917		
D. Inspection, maintenance or repair without refuelling				82		
H. Nuclear regulatory requirement					9	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					39	
Z. Others					103	
Subtotal	1656	144	0	2999	812	0
Total		1800			3811	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	144	54
13. Reactor Auxiliary System:		257
14. Safety Systems		5
15. Reactor Cooling System:		8
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		51
41. Main Generator System:		26
42. Electrical Power Supply System:		3
XX. Miscellaneous Systems		0
Total	144	413



## JP-9 FUKUSHIMA-DAIICHI-2

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

**Contractor:** GE/T (GENERAL ELECTRIC CO. / TOSHIBA CORPORATION)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 760.0 MW(e)  
**Design Net Capacity:** 760.0 MW(e)  
**Design Discharge Burnup:** 39500 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 5289.6 GW(e).h  
**Energy Availability Factor:** 80.4%  
**Load Factor:** 79.5%  
**Operating Factor:** 81.1%  
**Energy Unavailability Factor:** 19.6%  
**Total Off-line Time:** 1659 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	560.3	524.0	189.8	0.0	162.5	540.5	559.0	558.3	540.3	557.6	539.2	558.1	5289.6
<b>EAF (%)</b>	100.0	100.0	35.0	-0.1	31.5	100.0	100.0	100.0	100.0	100.0	99.9	100.0	80.4
<b>UCF (%)</b>	100.0	100.0	35.0	-0.1	31.5	100.0	100.0	100.0	100.0	100.0	99.9	100.0	80.4
<b>LF (%)</b>	99.1	102.6	33.6	0.0	28.7	98.8	98.9	98.7	98.7	98.5	98.5	98.7	79.5
<b>OF (%)</b>	100.0	103.6	35.5	0.0	35.1	100.0	100.0	100.0	100.0	99.9	100.0	100.0	81.1
<b>EUF (%)</b>	0.0	0.0	65.0	100.1	68.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	19.6
<b>PUF (%)</b>	0.0	0.0	65.0	100.1	60.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	18.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	09 Jun 1969	<b>Lifetime Generation:</b>	137296.0 GW(e).h
<b>Date of First Criticality:</b>	10 May 1973	<b>Cumulative Energy Availability Factor:</b>	61.0%
<b>Date of Grid Connection:</b>	24 Dec 1973	<b>Cumulative Load Factor:</b>	60.2%
<b>Date of Commercial Operation:</b>	18 Jul 1974	<b>Cumulative Unit Capability Factor:</b>	61.1%
		<b>Cumulative Energy Unavailability Factor:</b>	39.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	2591.9	760.0	83.0	83.0	77.2	77.2	77.2	77.2	3739	84.7
1975	622.1	760.0	11.2	35.3	11.2	33.3	9.3	32.1	982	11.2
1976	4191.4	760.0	62.8	46.3	62.8	45.1	62.8	44.4	6918	78.8
1977	49.7	760.0	0.7	33.3	0.7	32.5	0.7	31.9	96	1.1
1978	3876.3	760.0	58.2	38.8	58.2	38.2	58.2	37.8	6538	74.6
1979	2976.0	760.0	44.7	39.9	44.7	39.4	44.7	39.0	4752	54.2
1980	2889.0	760.0	43.3	40.4	43.3	40.0	43.3	39.7	4619	52.6
1981	3841.8	760.0	57.8	42.7	57.8	42.3	57.7	42.1	5794	66.1
1982	5290.2	760.0	79.4	47.0	79.4	46.7	79.5	46.5	7531	86.0
1983	3422.7	760.0	51.4	47.5	51.4	47.2	51.4	47.0	4934	56.3
1984	3698.7	760.0	56.0	48.3	56.0	48.0	55.4	47.8	5069	57.7
1985	4266.3	760.0	65.1	49.8	65.1	49.5	64.1	49.2	5952	67.9
1986	5541.1	760.0	84.3	52.5	84.3	52.3	83.2	51.9	7478	85.4
1987	3851.1	760.0	58.6	53.0	58.6	52.8	57.8	52.4	5260	60.0
1988	4101.3	760.0	62.3	53.6	62.3	53.4	61.4	53.0	5724	65.2
1989	6516.4	760.0	100.0	56.6	100.0	56.4	97.9	55.9	8760	100.0
1990	3122.8	760.0	47.6	56.1	47.6	55.9	46.9	55.3	4385	50.1
1991	3853.1	760.0	59.3	56.2	59.3	56.1	57.9	55.5	5291	60.4
1992	4568.5	760.0	69.8	57.0	69.7	56.8	68.4	56.2	6261	71.3
1993	4186.7	760.0	64.3	57.4	64.3	57.2	62.9	56.5	5659	64.6
1994	2266.0	760.0	36.0	56.3	34.7	56.1	34.0	55.4	3138	35.8
1995	6396.5	760.0	97.2	58.2	97.2	58.0	96.1	57.3	8520	97.3
1996	5192.3	760.0	78.8	59.1	78.8	58.9	77.8	58.2	6948	79.1
1997	4618.9	760.0	70.3	59.6	70.3	59.4	69.4	58.7	6197	70.7
1998	3976.2	760.0	60.9	59.7	60.6	59.5	59.7	58.7	5352	61.1
1999	3158.4	760.0	48.1	59.2	48.1	59.0	47.4	58.3	4216	48.1
2000	5167.2	760.0	78.6	59.9	78.6	59.8	77.4	59.0	6904	78.6
2001	5996.5	760.0	91.3	61.1	91.3	60.9	90.1	60.2	8036	91.7
2002	5101.0	760.0	77.8	61.7	77.8	61.5	76.6	60.7	6815	77.8
2003	1601.1	760.0	24.3	60.4	24.3	60.2	24.0	59.5	2136	24.4
2004	3671.5	760.0	55.7	60.2	55.7	60.1	55.0	59.3	4949	56.3
2005	3424.9	760.0	52.2	60.0	52.2	59.8	51.4	59.1	4735	54.1
2006	3219.5	760.0	49.2	59.7	49.1	59.5	48.4	58.8	4447	50.8
2007	5879.9	760.0	89.4	60.5	89.4	60.4	88.3	59.6	7891	90.1
2008	5289.6	760.0	80.4	61.1	80.4	61.0	79.5	60.2	7101	81.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		64			254	
B. Refuelling without a maintenance					44	
C. Inspection, maintenance or repair combined with refuelling	1632			2578		
D. Inspection, maintenance or repair without refuelling				118		
H. Nuclear regulatory requirement						14
J. Grid limitation, failure or grid unavailability						2
L. Human factor related					18	
Z. Others					52	
Subtotal	1632	64	0	2696	368	16
Total		1696			3080	

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	64	102
13. Reactor Auxiliary System:		6
14. Safety Systems		6
15. Reactor Cooling System:		59
31. Turbine and auxiliaries		36
32. Feedwater and Main Steam System		38
42. Electrical Power Supply System:		5
Total	64	252

# JP-10 FUKUSHIMA-DAIICHI-3

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 760.0 MW(e)  
**Design Net Capacity:** 760.0 MW(e)  
**Design Discharge Burnup:** 39500 MW.d/t  
**Status at end of year:** Operational

## 2. Production Summary 2008

**Net Energy Production:** 6668.8 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 100.2%  
**Operating Factor:** 100.3%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** -24 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	566.2	530.0	566.8	548.6	567.2	547.5	564.3	560.7	542.3	562.3	546.7	566.2	6668.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.8	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>	100.1	103.8	100.2	100.4	100.3	100.1	99.8	99.2	99.1	99.3	99.9	100.1	100.2
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	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	0.2	0.2	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 28 Dec 1970  
**Date of First Criticality:** 06 Sep 1974  
**Date of Grid Connection:** 26 Oct 1974  
**Date of Commercial Operation:** 27 Mar 1976

**Lifetime Generation:** 145771.0 GW(e).h  
**Cumulative Energy Availability Factor:** 65.8%  
**Cumulative Load Factor:** 65.4%  
**Cumulative Unit Capability Factor:** 65.8%  
**Cumulative Energy Unavailability Factor:** 34.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976	4441.7	784.0	80.2	80.2	80.2	80.2	77.1	77.1	6807	92.7
1977	2171.1	760.0	32.6	54.7	32.6	54.7	32.6	53.3	3575	40.8
1978	2753.7	760.0	41.4	50.0	41.4	50.0	41.4	49.1	4368	49.9
1979	4916.3	760.0	73.9	56.2	73.9	56.2	73.8	55.5	7190	82.1
1980	4287.0	760.0	64.2	57.9	64.2	57.9	64.2	57.3	6110	69.6
1981	3722.8	760.0	55.9	57.5	55.9	57.5	55.9	57.1	5173	59.1
1982	2886.8	760.0	42.8	55.4	42.8	55.4	43.4	55.1	4037	46.1
1983	4034.0	760.0	60.6	56.0	60.6	56.0	60.6	55.8	5643	64.4
1984	4497.3	760.0	67.7	57.4	67.7	57.4	67.4	57.1	6041	68.8
1985	5798.6	760.0	87.7	60.4	87.7	60.4	87.1	60.1	7738	88.3
1986	4234.2	760.0	63.5	60.7	63.5	60.7	63.6	60.4	5621	64.2
1987	3748.8	760.0	57.4	60.4	56.7	60.4	56.3	60.1	5086	58.1
1988	5123.0	760.0	77.0	61.7	77.0	61.7	76.7	61.4	6822	77.7
1989	5706.7	760.0	86.2	63.5	86.2	63.4	85.7	63.1	7616	86.9
1990	2919.5	760.0	44.3	62.2	44.3	62.2	43.9	61.8	3985	45.5
1991	4491.0	760.0	68.0	62.6	68.0	62.5	67.5	62.2	6003	68.5
1992	6098.7	760.0	92.0	64.3	92.0	64.3	91.4	63.9	8120	92.4
1993	4204.3	760.0	63.7	64.3	63.7	64.2	63.2	63.9	5655	64.6
1994	4202.3	760.0	63.6	64.2	63.6	64.2	63.1	63.8	5647	64.5
1995	5966.5	760.0	90.2	65.5	90.2	65.5	89.6	65.1	8036	91.7
1996	4909.7	760.0	73.9	65.9	73.9	65.9	73.5	65.5	6525	74.3
1997	2516.7	760.0	38.1	64.7	38.1	64.6	37.8	64.3	3345	38.2
1998	2632.7	760.0	42.2	63.7	42.2	63.7	39.5	63.2	3622	41.3
1999	5116.1	760.0	77.4	64.3	77.3	64.2	76.8	63.8	6792	77.5
2000	5932.5	760.0	89.5	65.3	89.4	65.2	88.9	64.8	7859	89.5
2001	5637.3	760.0	85.6	66.1	85.5	66.0	84.7	65.6	7506	85.7
2002	3567.3	760.0	54.1	65.6	54.0	65.6	53.6	65.1	4747	54.2
2003	2483.6	760.0	37.6	64.6	37.6	64.6	37.3	64.1	3290	37.6
2004	3969.7	760.0	59.5	64.4	59.5	64.4	59.5	63.9	5225	59.5
2005	5103.9	760.0	76.1	64.8	76.1	64.8	76.7	64.4	6987	79.8
2006	4081.9	760.0	61.8	64.7	61.8	64.7	61.3	64.3	5509	62.9
2007	4312.8	760.0	65.3	64.7	65.0	64.7	64.8	64.3	5840	66.7
2008	6668.8	760.0	100.0	65.8	100.0	65.8	100.2	65.4	8784	100.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					292	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				2473		
D. Inspection, maintenance or repair without refuelling				34		
E. Testing of plant systems or component:				22		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	0
Z. Others					8	
Subtotal	0	0	0	2529	300	0
Total	0			2829		

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		159
13. Reactor Auxiliary System:		0
15. Reactor Cooling System:		99
31. Turbine and auxiliaries:		29
42. Electrical Power Supply System:		2
Total	0	289

## JP-16 FUKUSHIMA-DAIICHI-4

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

**Contractor:** HITACHI (HITACHI LTD.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 760.0 MW(e)  
**Design Net Capacity:** 760.0 MW(e)  
**Design Discharge Burnup:** 39500 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 4410.3 GW(e).h  
**Energy Availability Factor:** 66.5%  
**Load Factor:** 66.2%  
**Operating Factor:** 69.8%  
**Energy Unavailability Factor:** 33.5%  
**Total Off-line Time:** 2649 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	524.4	471.2	403.5	0.0	0.0	0.0	235.1	561.2	543.8	562.1	545.7	563.4	4410.3
<b>EAF (%)</b>	93.4	89.5	73.0	-0.1	0.0	0.0	43.0	99.9	99.9	99.9	99.9	100.0	66.5
<b>UCF (%)</b>	100.0	100.0	86.4	-0.1	0.0	0.0	43.1	100.0	100.0	100.0	100.0	100.0	69.1
<b>LF (%)</b>	92.7	92.3	71.4	0.0	0.0	0.0	41.6	99.3	99.4	99.3	99.7	99.6	66.2
<b>OF (%)</b>	100.0	103.6	87.1	0.0	0.0	0.0	47.2	100.0	100.0	99.9	100.0	100.0	69.8
<b>EUF (%)</b>	6.6	10.5	27.0	100.1	100.0	100.0	57.0	0.1	0.1	0.1	0.1	0.0	33.5
<b>PUF (%)</b>	0.0	0.0	13.6	100.1	100.0	100.0	56.9	0.0	0.0	0.0	0.0	0.0	30.9
<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>	6.6	10.5	13.4	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	2.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	12 Feb 1973	<b>Lifetime Generation:</b>	142801.0 GW(e).h
<b>Date of First Criticality:</b>	28 Jan 1978	<b>Cumulative Energy Availability Factor:</b>	70.1%
<b>Date of Grid Connection:</b>	24 Feb 1978	<b>Cumulative Load Factor:</b>	69.8%
<b>Date of Commercial Operation:</b>	12 Oct 1978	<b>Cumulative Unit Capability Factor:</b>	70.2%
		<b>Cumulative Energy Unavailability Factor:</b>	29.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	1432.4	760.0	85.4	85.4	85.4	85.4	85.4	85.4	2194	99.4
1979	3917.4	760.0	58.8	64.2	58.8	64.2	58.8	64.2	6213	70.9
1980	4317.0	760.0	64.7	64.4	64.7	64.4	64.7	64.4	6326	72.0
1981	4667.5	760.0	70.1	66.1	70.1	66.1	70.1	66.2	6585	75.2
1982	5734.7	760.0	86.1	70.8	86.1	70.8	86.1	70.8	7776	88.8
1983	4818.2	760.0	72.4	71.1	72.4	71.1	72.4	71.1	6485	74.0
1984	4433.2	760.0	66.8	70.4	66.8	70.4	66.4	70.4	5924	67.4
1985	4409.0	760.0	66.6	69.9	66.6	69.9	66.2	69.8	5889	67.2
1986	4315.2	760.0	65.0	69.3	65.0	69.3	64.8	69.2	5733	65.4
1987	5964.0	760.0	89.9	71.5	89.9	71.5	89.6	71.4	7927	90.5
1988	5309.9	760.0	79.7	72.3	79.7	72.3	79.5	72.2	7066	80.4
1989	4232.6	760.0	63.8	71.6	63.8	71.6	63.6	71.4	5661	64.6
1990	4273.8	760.0	64.6	71.0	64.6	71.0	64.2	70.8	5715	65.2
1991	6483.4	760.0	98.0	73.0	98.0	73.0	97.4	72.8	8630	98.5
1992	4082.7	760.0	61.4	72.2	61.4	72.2	61.2	72.0	5475	62.3
1993	4206.6	760.0	63.5	71.6	63.4	71.6	63.2	71.4	5597	63.9
1994	6323.3	760.0	95.3	73.1	95.3	73.1	95.0	72.9	8416	96.1
1995	5485.7	760.0	82.8	73.7	82.7	73.7	82.4	73.4	7339	83.8
1996	4949.9	760.0	74.4	73.7	74.4	73.7	74.1	73.5	6545	74.5
1997	4556.8	760.0	68.6	73.4	68.6	73.4	68.4	73.2	6038	68.9
1998	5441.4	760.0	82.0	73.9	82.0	73.9	81.7	73.6	7216	82.4
1999	5890.5	760.0	88.8	74.6	88.8	74.6	88.5	74.3	7826	89.3
2000	4415.9	760.0	66.5	74.2	66.5	74.2	66.1	74.0	5856	66.7
2001	5858.5	760.0	88.7	74.8	88.4	74.8	88.0	74.6	7772	88.7
2002	4687.7	760.0	70.9	74.7	70.9	74.6	70.4	74.4	6191	70.7
2003	0.0	760.0	0.0	71.7	0.0	71.7	0.0	71.5	0	0.0
2004	4729.0	760.0	71.2	71.7	71.2	71.7	70.8	71.4	6262	71.3
2005	1515.6	760.0	22.9	69.9	22.9	69.9	22.8	69.6	2188	25.0
2006	4811.4	760.0	73.1	70.0	73.0	70.0	72.3	69.7	6500	74.2
2007	5050.6	760.0	76.9	70.3	76.2	70.2	75.9	69.9	6852	78.2
2008	4410.3	760.0	69.1	70.2	66.5	70.1	66.2	69.8	6111	69.8



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure	2687			1750	416	
C. Inspection, maintenance or repair combined with refuelling						
D. Inspection, maintenance or repair without refuelling						
E. Testing of plant systems or component:				50		
J. Grid limitation, failure or grid unavailability				0		0
Z. Others					90	
Subtotal	2687	0	0	1800	506	0
Total	2687			2306		

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		269
12. Reactor I&C Systems		3
13. Reactor Auxiliary System:		6
15. Reactor Cooling System:		32
31. Turbine and auxiliaries:		33
32. Feedwater and Main Steam System		62
41. Main Generator System:		8
42. Electrical Power Supply System:		0
Total	0	413

# JP-17 FUKUSHIMA-DAIICHI-5

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 760.0 MW(e)  
**Design Net Capacity:** 760.0 MW(e)  
**Design Discharge Burnup:** 39500 MW.d/t  
**Status at end of year:** Operational

## 2. Production Summary 2008

**Net Energy Production:** 3930.7 GW(e).h  
**Energy Availability Factor:** 57.3%  
**Load Factor:** 59.0%  
**Operating Factor:** 58.2%  
**Energy Unavailability Factor:** 42.7%  
**Total Off-line Time:** 3660 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	336.5	0.0	0.0	0.0	0.0	129.6	577.3	581.9	562.3	584.6	569.1	589.3	3930.7
<b>EAF (%)</b>	60.6	-3.6	0.0	-0.1	0.0	25.7	98.8	100.0	100.0	100.0	100.0	100.0	57.3
<b>UCF (%)</b>	60.7	-3.6	0.0	-0.1	0.0	25.7	100.0	100.0	100.0	100.0	100.0	100.0	57.4
<b>LF (%)</b>	59.5	0.0	0.0	0.0	0.0	23.7	102.1	102.9	102.8	103.3	104.0	104.2	59.0
<b>OF (%)</b>	61.3	0.0	0.0	0.0	0.0	31.7	100.0	100.0	100.0	99.9	100.0	100.0	58.2
<b>EUF (%)</b>	39.4	103.6	100.0	100.1	100.0	74.3	1.2	0.0	0.0	0.0	0.0	0.0	42.7
<b>PUF (%)</b>	39.3	103.6	100.0	100.1	96.8	4.3	0.0	0.0	0.0	0.0	0.0	0.0	36.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	3.2	70.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
<b>XUF (%)</b>	0.1	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 22 May 1972  
**Date of First Criticality:** 26 Aug 1977  
**Date of Grid Connection:** 22 Sep 1977  
**Date of Commercial Operation:** 18 Apr 1978

**Lifetime Generation:** 144822.0 GW(e).h  
**Cumulative Energy Availability Factor:** 70.9%  
**Cumulative Load Factor:** 70.4%  
**Cumulative Unit Capability Factor:** 71.0%  
**Cumulative Energy Unavailability Factor:** 29.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	4047.9	760.0	80.7	80.7	80.7	80.7	80.7	80.7	6532	99.0
1979	3898.6	760.0	58.6	68.1	58.6	68.1	58.6	68.1	5847	66.7
1980	4282.6	760.0	64.1	66.6	64.1	66.6	64.2	66.6	6467	73.6
1981	4553.9	760.0	68.4	67.1	68.4	67.1	68.4	67.1	6616	75.5
1982	4061.3	760.0	60.7	65.8	60.7	65.8	61.0	65.8	5789	66.1
1983	5338.8	760.0	80.2	68.3	80.2	68.3	80.2	68.3	7328	83.7
1984	4691.5	760.0	70.9	68.7	70.9	68.7	70.3	68.6	6293	71.6
1985	4112.4	760.0	62.1	67.8	62.1	67.8	61.8	67.7	5547	63.3
1986	4157.4	760.0	63.2	67.3	63.2	67.3	62.4	67.1	5622	64.2
1987	3995.0	760.0	60.8	66.6	60.5	66.6	60.0	66.4	5399	61.6
1988	5952.7	760.0	90.0	68.8	90.0	68.8	89.2	68.5	7973	90.8
1989	4766.5	760.0	72.2	69.1	72.2	69.1	71.6	68.8	6401	73.1
1990	3956.5	760.0	60.2	68.4	60.2	68.4	59.4	68.0	5354	61.1
1991	6575.8	760.0	100.0	70.7	100.0	70.7	98.8	70.3	8760	100.0
1992	4841.2	760.0	73.3	70.9	73.3	70.8	72.5	70.4	6488	73.9
1993	4059.7	760.0	61.7	70.3	61.7	70.3	61.0	69.8	5448	62.2
1994	4246.2	760.0	64.6	70.0	64.6	69.9	63.8	69.5	5723	65.3
1995	5878.7	760.0	89.1	71.0	89.1	71.0	88.3	70.5	7885	90.0
1996	5666.9	760.0	85.6	71.8	85.6	71.8	84.9	71.3	7521	85.6
1997	4609.4	760.0	69.8	71.7	69.8	71.7	69.2	71.2	6139	70.1
1998	5369.9	760.0	81.7	72.2	81.5	72.2	80.7	71.7	7217	82.4
1999	6154.1	760.0	93.3	73.2	93.2	73.1	92.4	72.6	8184	93.4
2000	1647.0	760.0	24.9	71.0	24.9	71.0	24.7	70.5	2187	24.9
2001	5905.1	760.0	89.7	71.8	89.6	71.8	88.7	71.3	7869	89.8
2002	6590.5	760.0	100.0	73.0	99.8	72.9	99.0	72.4	8760	100.0
2003	2723.8	760.0	41.4	71.7	41.4	71.7	40.9	71.2	3627	41.4
2004	5471.3	760.0	82.9	72.2	82.8	72.1	82.0	71.6	7281	82.9
2005	2792.6	760.0	42.4	71.1	42.4	71.0	41.9	70.5	3781	43.2
2006	4656.9	760.0	70.7	71.1	70.6	71.0	69.9	70.5	6241	71.2
2007	5389.6	760.0	82.0	71.4	81.8	71.4	81.0	70.8	7205	82.2
2008	3930.7	760.0	57.4	71.0	57.3	70.9	59.0	70.4	5100	58.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		528			134	
C. Inspection, maintenance or repair combined with refuelling	3168			2004		
D. Inspection, maintenance or repair without refuelling				54		
E. Testing of plant systems or component:				0		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	
Z. Others					51	
Subtotal	3168	528	0	2058	185	0
Total		3696			2243	

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		12
13. Reactor Auxiliary System:		3
14. Safety Systems		62
15. Reactor Cooling System:		7
31. Turbine and auxiliaries	528	19
32. Feedwater and Main Steam System		12
41. Main Generator System:		14
42. Electrical Power Supply System:		2
Total	528	131

# JP-18 FUKUSHIMA-DAIICHI-6

**Operator:** TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

**Contractor:** GE/T (GENERAL ELECTRIC CO. / TOSHIBA CORPORATION)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1067.0 MW(e)  
**Design Net Capacity:** 1067.0 MW(e)  
**Design Discharge Burnup:** 39500 MW.d/t  
**Status at end of year:** Operational

## 2. Production Summary 2008

**Net Energy Production:** 8424.5 GW(e).h  
**Energy Availability Factor:** 89.3%  
**Load Factor:** 90.1%  
**Operating Factor:** 90.0%  
**Energy Unavailability Factor:** 10.7%  
**Total Off-line Time:** 877 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	536.4	798.0	773.6	800.3	773.3	799.1	797.0	771.0	799.6	775.0	801.1	8424.5
<b>EAF (%)</b>	0.0	71.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.3
<b>UCF (%)</b>	0.0	71.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.3
<b>LF (%)</b>	0.0	74.8	100.5	100.8	100.8	100.7	100.7	100.4	100.4	100.6	100.9	100.9	90.1
<b>OF (%)</b>	0.0	80.2	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	90.0
<b>EUf (%)</b>	100.0	28.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7
<b>PUF (%)</b>	100.0	28.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7
<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	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	26 Oct 1973	<b>Lifetime Generation:</b>	193853.0 GW(e).h
<b>Date of First Criticality:</b>	09 Mar 1979	<b>Cumulative Energy Availability Factor:</b>	70.7%
<b>Date of Grid Connection:</b>	04 May 1979	<b>Cumulative Load Factor:</b>	70.4%
<b>Date of Commercial Operation:</b>	24 Oct 1979	<b>Cumulative Unit Capability Factor:</b>	70.8%
		<b>Cumulative Energy Unavailability Factor:</b>	29.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	1967.8	1053.0	84.5	84.5	84.5	84.5	85.1	85.1	1906	86.3
1980	6441.1	1047.0	69.9	72.9	69.9	72.9	70.0	73.1	6289	71.6
1981	7418.6	1067.0	81.5	76.7	81.5	76.7	79.4	75.9	7756	88.5
1982	6666.5	1067.0	71.2	75.0	71.2	75.0	71.3	74.5	6577	75.1
1983	5387.8	1067.0	57.6	70.9	57.6	70.9	57.6	70.5	5308	60.6
1984	5933.2	1067.0	64.2	69.6	64.2	69.6	63.3	69.1	5708	65.0
1985	5384.8	1067.0	58.1	67.8	58.1	67.8	57.6	67.3	5196	59.3
1986	7783.5	1067.0	84.3	70.1	84.3	70.1	83.3	69.5	7390	84.4
1987	7789.2	1067.0	84.1	71.8	84.1	71.8	83.3	71.2	7406	84.5
1988	5593.1	1067.0	60.1	70.5	60.1	70.5	59.7	69.9	5385	61.3
1989	5128.4	1067.0	55.8	69.1	55.8	69.1	54.9	68.4	4956	56.6
1990	7727.1	1067.0	82.9	70.3	82.9	70.3	82.7	69.7	7394	84.4
1991	6948.7	1067.0	75.1	70.7	75.1	70.7	74.3	70.1	6627	75.7
1992	5213.6	1067.0	56.0	69.6	56.0	69.6	55.6	69.0	4993	56.8
1993	6530.9	1067.0	70.2	69.6	70.2	69.6	69.9	69.1	6168	70.4
1994	8079.4	1067.0	86.8	70.7	86.7	70.7	86.4	70.2	7679	87.7
1995	6850.8	1067.0	73.7	70.9	73.6	70.9	73.3	70.4	6517	74.4
1996	6157.8	1067.0	66.0	70.6	66.0	70.6	65.7	70.1	5804	66.1
1997	9307.7	1067.0	99.9	72.2	99.8	72.2	99.6	71.7	8760	100.0
1998	6329.0	1067.0	68.1	72.0	68.0	72.0	67.7	71.5	6026	68.8
1999	7960.5	1067.0	85.8	72.7	85.5	72.7	85.2	72.2	7523	85.9
2000	7495.6	1067.0	80.4	73.1	80.4	73.0	80.0	72.6	7074	80.5
2001	7778.9	1067.0	83.7	73.6	83.7	73.5	83.2	73.0	7417	84.7
2002	6270.9	1067.0	67.5	73.3	67.5	73.3	67.1	72.8	5912	67.5
2003	4623.9	1067.0	49.7	72.3	49.7	72.3	49.5	71.8	4338	49.5
2004	1088.8	1067.0	11.7	69.9	11.7	69.9	11.6	69.4	1028	11.7
2005	7986.5	1067.0	85.2	70.5	85.2	70.5	85.4	70.0	7503	85.7
2006	5321.8	1067.0	56.7	70.0	56.7	70.0	56.9	69.6	5004	57.1
2007	6833.5	1067.0	74.7	70.2	73.0	70.1	73.1	69.7	6552	74.8
2008	8424.5	1067.0	89.3	70.8	89.3	70.7	90.1	70.4	7883	90.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1979 to 2008 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	916			1957		
D. Inspection, maintenance or repair without refuelling				140		
E. Testing of plant systems or component				0		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					7	
Z. Others					52	
Subtotal	916	0	0	2097	282	0
Total	916			2379		

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

System	2008 Hours Lost	1979 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		140
13. Reactor Auxiliary System:		23
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		41
41. Main Generator System:		10
Total	0	221

# JP-25 FUKUSHIMA-DAINI-1

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 39500 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 9333.7 GW(e).h  
 Energy Availability Factor: 100.0%  
 Load Factor: 99.9%  
 Operating Factor: 100.3%  
 Energy Unavailability Factor: 0.0%  
 Total Off-line Time: -24 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	790.3	739.7	791.8	767.1	794.4	767.4	791.0	788.8	761.3	788.4	764.1	789.5	9333.7
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	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	99.9	100.0
LF (%)	99.5	103.2	99.7	100.0	100.1	99.9	99.6	99.4	99.1	99.2	99.5	99.4	99.9
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	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	0.1	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 16 Mar 1976      Lifetime Generation: 189747.0 GW(e).h  
 Date of First Criticality: 17 Jun 1981      Cumulative Energy Availability Factor: 76.1%  
 Date of Grid Connection: 31 Jul 1981      Cumulative Load Factor: 75.4%  
 Date of Commercial Operation: 20 Apr 1982      Cumulative Unit Capability Factor: 76.2%  
    Cumulative Energy Unavailability Factor: 23.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1982	6738.3	1067.0	95.7	95.7	95.7	95.7	95.7	95.7	6522	98.8
1983	6282.2	1067.0	67.2	79.4	67.2	79.4	67.2	79.4	6130	70.0
1984	6344.4	1067.0	68.6	75.5	68.6	75.5	67.7	75.2	6175	70.3
1985	8152.9	1067.0	88.0	78.8	88.0	78.8	87.2	78.4	7776	88.8
1986	7741.0	1067.0	83.6	79.8	83.6	79.8	82.8	79.3	7404	84.5
1987	6992.1	1067.0	75.8	79.1	75.8	79.1	74.8	78.5	6710	76.6
1988	5959.3	1067.0	64.4	76.9	64.4	76.9	63.6	76.3	5744	65.4
1989	6246.2	1067.0	67.4	75.7	67.4	75.7	66.8	75.1	6029	68.8
1990	8217.0	1067.0	88.9	77.2	88.9	77.2	87.9	76.6	7914	90.3
1991	6191.1	1067.0	67.2	76.2	67.2	76.2	66.2	75.5	5927	67.7
1992	6901.5	1067.0	75.1	76.1	74.6	76.0	73.6	75.3	6656	75.8
1993	5613.1	1067.0	60.9	74.8	60.9	74.8	60.1	74.0	5384	61.5
1994	8309.1	1067.0	90.1	76.0	90.1	76.0	88.9	75.2	7936	90.6
1995	7727.5	1067.0	83.5	76.5	83.5	76.5	82.7	75.7	7333	83.7
1996	6761.4	1067.0	73.1	76.3	73.1	76.3	72.1	75.5	6425	73.1
1997	7304.8	1067.0	79.2	76.5	79.2	76.5	78.2	75.7	6993	79.8
1998	7694.1	1067.0	83.3	76.9	83.3	76.9	82.3	76.1	7318	83.5
1999	7389.4	1067.0	80.0	77.1	80.0	77.0	79.1	76.2	7011	80.0
2000	8229.0	1067.0	89.1	77.7	89.1	77.7	87.8	76.8	7824	89.1
2001	5902.6	1067.0	64.4	77.0	64.4	77.0	63.2	76.2	5645	64.4
2002	9238.2	1067.0	100.0	78.1	99.9	78.1	98.8	77.2	8760	100.0
2003	3239.3	1067.0	34.9	76.2	34.9	76.1	34.7	75.3	3061	34.9
2004	6749.7	1067.0	73.2	76.0	72.6	76.0	72.0	75.1	6522	74.2
2005	5606.2	1067.0	60.3	75.4	60.3	75.3	60.0	74.5	5382	61.4
2006	6846.8	1067.0	73.5	75.3	73.5	75.2	73.3	74.5	6473	73.9
2007	6891.7	1067.0	74.3	75.3	74.2	75.2	73.7	74.4	6547	74.7
2008	9333.7	1067.0	100.0	76.2	100.0	76.1	99.9	75.4	8784	100.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					347	
B. Refuelling without a maintenance outage					2	
C. Inspection, maintenance or repair combined with refuelling				1584		
D. Inspection, maintenance or repair without refuelling				34		
Subtotal	0	0	0	1618	349	0
Total	0			1967		

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		97
13. Reactor Auxiliary Systems		18
15. Reactor Cooling Systems		184
31. Turbine and auxiliaries		18
35. All other I&C Systems		12
41. Main Generator Systems		2
42. Electrical Power Supply Systems		14
Total	0	345



# JP-26 FUKUSHIMA-DAINI-2

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: HITACHI (HITACHI LTD.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 39500 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 7896.3 GW(e).h  
 Energy Availability Factor: 84.3%  
 Load Factor: 84.5%  
 Operating Factor: 84.7%  
 Energy Unavailability Factor: 15.7%  
 Total Off-line Time: 1344 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	793.8	743.2	794.3	769.8	796.5	770.4	794.0	790.2	762.8	790.4	90.8	0.0	7896.3
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0	12.8	0.0	84.3
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.8	0.0	84.3
LF (%)	100.0	103.7	100.1	100.3	100.3	100.3	100.0	99.5	99.3	99.4	11.8	0.0	84.5
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	13.3	0.0	84.7
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	87.2	100.0	15.7
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.2	100.0	15.7
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	0.1	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 25 May 1979  
 Date of First Criticality: 26 Apr 1983  
 Date of Grid Connection: 23 Jun 1983  
 Date of Commercial Operation: 03 Feb 1984

Lifetime Generation: 172839.0 GW(e).h  
 Cumulative Energy Availability Factor: 73.8%  
 Cumulative Load Factor: 73.4%  
 Cumulative Unit Capability Factor: 73.8%  
 Cumulative Energy Unavailability Factor: 26.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	8480.8	1067.0	98.9	98.9	98.9	98.9	98.9	98.9	8040	100.0
1985	6760.1	1067.0	72.9	85.3	72.9	85.3	72.3	85.0	6534	74.6
1986	7063.9	1067.0	76.2	82.2	76.2	82.2	75.6	81.8	6727	76.8
1987	6844.9	1067.0	74.3	80.2	74.3	80.2	73.2	79.6	6607	75.4
1988	7628.4	1067.0	82.1	80.6	82.1	80.6	81.4	80.0	7238	82.4
1989	8308.8	1067.0	89.4	82.1	89.4	82.1	88.9	81.5	7920	90.4
1990	6261.3	1067.0	67.3	79.9	67.3	79.9	67.0	79.4	5956	68.0
1991	6887.3	1067.0	74.3	79.2	74.3	79.2	73.7	78.7	6579	75.1
1992	8116.3	1067.0	87.1	80.1	87.1	80.1	86.6	79.6	7656	87.2
1993	6785.7	1067.0	73.2	79.4	73.2	79.4	72.6	78.9	6427	73.4
1994	7058.2	1067.0	76.0	79.1	76.0	79.1	75.5	78.5	6696	76.4
1995	6786.7	1067.0	73.1	78.6	73.1	78.6	72.6	78.0	6435	73.5
1996	9327.9	1067.0	100.0	80.3	100.0	80.3	99.5	79.7	8784	100.0
1997	7405.6	1067.0	79.8	80.2	79.8	80.2	79.2	79.7	7021	80.1
1998	7447.1	1067.0	80.2	80.2	80.2	80.2	79.7	79.7	7104	81.1
1999	8231.6	1067.0	88.7	80.8	88.6	80.8	88.1	80.2	7765	88.6
2000	8874.5	1067.0	95.2	81.6	95.2	81.6	94.7	81.1	8372	95.3
2001	6761.9	1067.0	73.1	81.1	73.1	81.1	72.3	80.6	6378	72.8
2002	4645.2	1067.0	50.2	79.5	50.2	79.5	49.7	78.9	4398	50.2
2003	0.0	1067.0	0.0	75.5	0.0	75.5	0.0	75.0	0	0.0
2004	3169.8	1067.0	33.9	73.5	33.9	73.5	33.8	73.0	2978	33.9
2005	7593.5	1067.0	81.3	73.9	81.2	73.9	81.2	73.4	7128	81.4
2006	7858.2	1067.0	84.3	74.3	84.3	74.3	84.1	73.9	7413	84.6
2007	4793.1	1067.0	51.8	73.4	51.6	73.4	51.3	72.9	4593	52.4
2008	7896.3	1067.0	84.3	73.8	84.3	73.8	84.5	73.4	7416	84.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					255	
C. Inspection, maintenance or repair combined with refuelling	1368			1727		
D. Inspection, maintenance or repair without refuelling				154		
Z. Others					150	
Subtotal	1368	0	0	1881	405	0
Total	1368			2286		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		120
12. Reactor I&C Systems		49
13. Reactor Auxiliary Systems		21
14. Safety Systems		7
15. Reactor Cooling Systems		57
Total	0	254

# JP-35 FUKUSHIMA-DAINI-3

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 1067.0 MW(e)

Design Net Capacity: 1067.0 MW(e)

Design Discharge Burnup: 39500 MW.d/t

Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 6730.2 GW(e).h

Energy Availability Factor: 72.5%

Load Factor: 72.0%

Operating Factor: 73.4%

Energy Unavailability Factor: 27.5%

Total Off-line Time: 2333 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	786.6	736.7	788.5	763.7	790.2	764.3	784.7	575.4	112.6	0.0	0.0	627.4	6730.2
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	99.7	74.2	16.0	0.1	0.0	80.1	72.5
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	99.7	74.3	16.1	0.1	0.0	80.1	72.5
LF (%)	99.1	102.7	99.3	99.5	99.5	99.5	98.9	72.5	14.7	0.0	0.0	79.0	72.0
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	77.0	16.7	0.0	0.0	83.6	73.4
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.3	25.8	84.0	99.9	100.0	19.9	27.5
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	83.9	99.9	76.7	7.0	22.3
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.7	0.0	0.0	23.3	12.9	5.2
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 23 Mar 1981      Lifetime Generation: 144490.0 GW(e).h

Date of First Criticality: 18 Oct 1984      Cumulative Energy Availability Factor: 65.7%

Date of Grid Connection: 14 Dec 1984      Cumulative Load Factor: 64.8%

Date of Commercial Operation: 21 Jun 1985      Cumulative Unit Capability Factor: 65.7%

   Cumulative Energy Unavailability Factor: 34.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	4851.3	1067.0	95.4	95.4	95.4	95.4	88.5	88.5	4707	91.6
1986	6837.4	1067.0	74.4	82.1	74.4	82.1	73.2	78.8	6559	74.9
1987	7459.9	1067.0	80.8	81.6	80.8	81.6	79.8	79.2	7104	81.1
1988	8389.1	1067.0	90.7	84.2	90.7	84.2	89.5	82.1	8126	92.5
1989	120.2	1067.0	1.3	66.1	1.3	66.1	1.3	64.5	144	1.6
1990	912.9	1067.0	9.8	56.0	9.8	56.0	9.8	54.7	1037	11.8
1991	7695.1	1067.0	83.1	60.1	83.1	60.1	82.3	58.9	7344	83.8
1992	7533.2	1067.0	81.3	62.9	81.3	62.9	80.4	61.7	7195	81.9
1993	6810.5	1067.0	73.8	64.2	73.8	64.2	72.9	63.0	6494	74.1
1994	4841.6	1067.0	52.5	63.0	52.5	63.0	51.8	61.9	4669	53.3
1995	8992.5	1067.0	97.2	66.2	97.2	66.2	96.2	65.1	8557	97.7
1996	8060.6	1067.0	87.0	68.0	87.0	68.0	86.0	66.9	7642	87.0
1997	7487.4	1067.0	81.2	69.0	81.2	69.0	80.1	68.0	7120	81.3
1998	8284.7	1067.0	89.9	70.6	89.7	70.6	88.6	69.5	7905	90.2
1999	8566.8	1067.0	92.7	72.1	92.7	72.1	91.7	71.0	8127	92.8
2000	7643.9	1067.0	82.5	72.8	82.5	72.8	81.6	71.7	7258	82.6
2001	3288.0	1067.0	35.9	70.6	35.8	70.5	35.2	69.5	3185	36.4
2002	6123.4	1067.0	66.3	70.3	66.3	70.3	65.5	69.2	5806	66.3
2003	0.0	1067.0	0.0	66.5	0.0	66.5	0.0	65.5	0	0.0
2004	6862.3	1067.0	73.7	66.9	73.7	66.9	73.2	65.9	6508	74.1
2005	359.5	1067.0	4.0	63.8	4.0	63.8	3.8	62.9	390	4.5
2006	8677.4	1067.0	93.6	65.2	93.6	65.2	92.8	64.3	8221	93.8
2007	6442.9	1067.0	69.8	65.4	69.8	65.4	68.9	64.5	6154	70.3
2008	6730.2	1067.0	72.5	65.7	72.5	65.7	72.0	64.8	6427	73.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		435			614	
C. Inspection, maintenance or repair combined with refuelling	1933			1963		
D. Inspection, maintenance or repair without refuelling				56		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					154	
Z. Others					35	
Subtotal	1933	435	0	2019	803	0
Total		2368			2822	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		148
12. Reactor I&C Systems	264	195
15. Reactor Cooling System	171	257
32. Feedwater and Main Steam System		12
Total	435	612

# JP-38 FUKUSHIMA-DAINI-4

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: HITACHI (HITACHI LTD.)

## 1. Station Details

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 1067.0 MW(e)

Design Net Capacity: 1067.0 MW(e)

Design Discharge Burnup: 39500 MW.d/t

Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 7144.9 GW(e).h

Energy Availability Factor: 76.6%

Load Factor: 76.4%

Operating Factor: 77.2%

Energy Unavailability Factor: 23.4%

Total Off-line Time: 1994 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	792.8	38.1	0.0	56.0	796.1	770.1	794.1	790.3	761.2	788.9	765.0	792.4	7144.9
EAF (%)	100.0	3.0	0.0	9.4	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	76.6
UCF (%)	100.0	3.0	0.0	9.4	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	76.6
LF (%)	99.9	5.3	0.0	7.3	100.3	100.2	100.0	99.6	99.1	99.2	99.6	99.8	76.4
OF (%)	100.0	7.1	0.0	13.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	77.2
EUUF (%)	0.0	97.0	100.0	90.6	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	23.4
PUF (%)	0.0	97.0	100.0	90.6	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	23.4
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 (%)	0.0	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 28 May 1981      Lifetime Generation: 145762.0 GW(e).h

Date of First Criticality: 24 Oct 1986      Cumulative Energy Availability Factor: 72.5%

Date of Grid Connection: 17 Dec 1986      Cumulative Load Factor: 71.8%

Date of Commercial Operation: 25 Aug 1987      Cumulative Unit Capability Factor: 72.6%

   Cumulative Energy Unavailability Factor: 27.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	3642.2	1067.0	100.0	100.0	100.0	100.0	93.0	93.0	3463	94.3
1988	7010.3	1067.0	75.5	82.7	75.5	82.7	74.8	80.2	6739	76.7
1989	9137.9	1067.0	99.2	89.6	99.2	89.6	97.8	87.4	8728	99.6
1990	7051.4	1067.0	76.0	85.6	76.0	85.6	75.4	83.9	6757	77.1
1991	7278.9	1067.0	79.0	84.1	79.0	84.1	77.9	82.6	7029	80.2
1992	5901.7	1067.0	63.8	80.4	63.5	80.3	63.0	78.9	5646	64.3
1993	9049.0	1067.0	97.6	83.1	97.5	83.0	96.8	81.7	8608	98.3
1994	6735.5	1067.0	73.5	81.8	72.7	81.6	72.1	80.4	6481	74.0
1995	7782.7	1067.0	83.9	82.0	83.9	81.9	83.3	80.8	7385	84.3
1996	6842.6	1067.0	73.7	81.1	73.7	81.0	73.0	79.9	6470	73.7
1997	9275.9	1067.0	99.9	82.9	99.9	82.8	99.2	81.8	8760	100.0
1998	8075.0	1067.0	87.2	83.3	87.2	83.2	86.4	82.2	7678	87.6
1999	8136.0	1067.0	87.8	83.7	87.8	83.6	87.0	82.6	7699	87.9
2000	6685.2	1067.0	72.0	82.8	72.0	82.7	71.3	81.7	6329	72.1
2001	9250.2	1067.0	99.9	84.0	99.7	83.9	99.0	82.9	8760	100.0
2002	5986.6	1067.0	64.7	82.7	64.7	82.6	64.0	81.7	5668	64.7
2003	0.0	1067.0	0.0	77.7	0.0	77.6	0.0	76.7	0	0.0
2004	1450.0	1067.0	15.5	74.1	15.5	74.0	15.5	73.2	1360	15.5
2005	5345.9	1067.0	57.2	73.2	57.2	73.1	57.2	72.3	5048	57.6
2006	5763.7	1067.0	62.0	72.6	62.0	72.6	61.7	71.8	5482	62.6
2007	6258.2	1067.0	67.1	72.4	67.1	72.3	67.0	71.6	5911	67.5
2008	7144.9	1067.0	76.6	72.6	76.6	72.5	76.4	71.8	6766	77.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					494	
C. Inspection, maintenance or repair combined with refuelling	2034			1486		
D. Inspection, maintenance or repair without refuelling				91		
Z. Others					259	
Subtotal	2034	0	0	1577	753	0
Total	2034			2330		

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		34
12. Reactor I&C Systems		30
15. Reactor Cooling System:		303
21. Fuel Handling and Storage Facilities		25
32. Feedwater and Main Steam System		89
33. Circulating Water System		1
42. Electrical Power Supply System:		9
Total	0	491

# 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 4104.1 GW(e).h  
**Energy Availability Factor:** 85.3%  
**Load Factor:** 88.6%  
**Operating Factor:** 86.1%  
**Energy Unavailability Factor:** 14.7%  
**Total Off-line Time:** 1215 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	80.1	409.4	395.9	408.8	394.7	404.5	403.8	393.2	408.1	395.8	409.9	4104.1
<b>EAF (%)</b>	0.0	18.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.3
<b>UCF (%)</b>	0.0	18.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.3
<b>LF (%)</b>	0.0	22.5	104.0	104.1	103.9	103.6	102.8	102.6	103.2	103.5	103.9	104.2	88.6
<b>OF (%)</b>	0.0	29.9	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	86.1
<b>EUF (%)</b>	100.0	81.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.7
<b>PUF (%)</b>	100.0	81.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.7
<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	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	15 Sep 1971	<b>Lifetime Generation:</b>	115591.0 GW(e).h
<b>Date of First Criticality:</b>	28 Jan 1975	<b>Cumulative Energy Availability Factor:</b>	73.1%
<b>Date of Grid Connection:</b>	14 Feb 1975	<b>Cumulative Load Factor:</b>	73.6%
<b>Date of Commercial Operation:</b>	15 Oct 1975	<b>Cumulative Unit Capability Factor:</b>	73.1%
		<b>Cumulative Energy Unavailability Factor:</b>	26.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	1041.2	529.0	89.2	89.2	89.2	89.2	89.1	89.1	2208	100.0
1976	3652.7	559.0	74.4	77.2	74.4	77.2	74.4	77.2	7022	79.9
1977	3785.0	532.0	83.4	79.9	83.4	79.9	81.2	79.0	7764	88.6
1978	3415.8	529.0	73.7	78.0	73.7	78.0	73.7	77.4	6681	76.3
1979	2219.8	531.0	47.7	71.0	47.7	71.0	47.7	70.5	4390	50.1
1980	3533.0	529.0	75.6	71.9	75.6	71.9	76.0	71.5	6772	77.1
1981	2739.8	529.0	58.9	69.8	58.9	69.8	59.1	69.6	5309	60.6
1982	3744.7	529.0	80.7	71.3	80.7	71.3	80.8	71.1	7072	80.7
1983	3960.5	529.0	85.4	73.0	85.4	73.0	85.5	72.8	7678	87.6
1984	3139.7	529.0	67.5	72.4	67.5	72.4	67.6	72.3	6072	69.1
1985	3089.7	529.0	66.7	71.8	66.7	71.8	66.7	71.7	6056	69.1
1986	2867.2	529.0	61.8	71.0	61.8	71.0	61.9	70.9	5425	61.9
1987	3762.7	529.0	81.3	71.8	81.1	71.8	81.2	71.7	7285	83.2
1988	2365.6	529.0	50.9	70.2	50.9	70.2	50.9	70.1	4743	54.0
1989	2183.2	529.0	47.1	68.6	47.1	68.6	47.1	68.5	4310	49.2
1990	2725.7	529.0	58.8	68.0	58.8	68.0	58.8	67.9	5159	58.9
1991	3357.5	529.0	72.7	68.3	72.4	68.2	72.5	68.2	6542	74.7
1992	3291.7	529.0	70.8	68.4	70.7	68.4	70.8	68.3	6397	72.8
1993	2797.4	529.0	60.3	68.0	60.3	67.9	60.4	67.9	5459	62.3
1994	2530.6	529.0	54.5	67.3	54.5	67.3	54.6	67.2	4787	54.6
1995	4151.0	529.0	89.4	68.4	89.4	68.3	89.6	68.3	7842	89.5
1996	4107.8	529.0	88.3	69.3	88.3	69.3	88.4	69.2	7829	89.1
1997	3653.4	529.0	78.7	69.7	78.7	69.7	78.8	69.7	6984	79.7
1998	3703.2	529.0	79.8	70.2	79.8	70.1	79.9	70.1	7057	80.6
1999	3305.9	529.0	71.2	70.2	71.2	70.2	71.3	70.2	6362	72.6
2000	4435.5	529.0	95.3	71.2	95.3	71.2	95.5	71.2	8400	95.6
2001	2512.3	529.0	54.1	70.5	54.1	70.5	54.2	70.5	4745	54.2
2002	3822.9	529.0	81.0	70.9	81.0	70.9	82.5	71.0	7097	81.0
2003	3622.8	529.0	76.4	71.1	76.4	71.1	78.2	71.2	6692	76.4
2004	4768.4	529.0	100.0	72.1	100.0	72.1	102.6	72.3	8784	100.0
2005	3310.8	529.0	69.7	72.0	69.7	72.0	71.4	72.3	6180	70.5
2006	3722.6	529.0	78.1	72.2	78.1	72.2	80.3	72.5	6891	78.7
2007	4299.3	529.0	89.8	72.8	89.8	72.8	92.8	73.1	7873	89.9
2008	4104.1	529.0	85.3	73.1	85.3	73.1	88.6	73.6	7545	86.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 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	1239			2061		
D. Inspection, maintenance or repair without refuelling				20		
Subtotal	1239	0	0	2081	142	0
Total	1239			2223		

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		10
13. Reactor Auxiliary System:		48
15. Reactor Cooling System:		19
16. Steam generation system:		61
42. Electrical Power Supply System:		2
Total	0	140



## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3340.5 GW(e).h  
**Energy Availability Factor:** 69.5%  
**Load Factor:** 72.1%  
**Operating Factor:** 70.5%  
**Energy Unavailability Factor:** 30.5%  
**Total Off-line Time:** 2580 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	409.6	382.9	364.5	0.0	0.0	0.0	180.0	401.9	391.8	406.4	394.6	408.7	3340.5
<b>EAF (%)</b>	100.0	100.0	89.0	-0.1	0.0	0.0	45.7	100.0	100.0	100.0	100.0	100.0	69.5
<b>UCF (%)</b>	100.0	100.0	89.0	-0.1	0.0	0.0	45.7	100.0	100.0	100.0	100.0	100.0	69.5
<b>LF (%)</b>	104.1	107.7	92.6	0.0	0.0	0.0	45.7	102.1	102.9	103.1	103.6	103.9	72.1
<b>OF (%)</b>	100.0	103.6	89.5	0.0	0.0	0.0	54.0	100.0	100.0	99.9	100.0	100.0	70.5
<b>EUF (%)</b>	0.0	0.0	11.0	100.1	100.0	100.0	54.3	0.0	0.0	0.0	0.0	0.0	30.5
<b>PUF (%)</b>	0.0	0.0	11.0	100.1	100.0	100.0	54.3	0.0	0.0	0.0	0.0	0.0	30.5
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Feb 1977	<b>Lifetime Generation:</b>	109422.0 GW(e).h
<b>Date of First Criticality:</b>	21 May 1980	<b>Cumulative Energy Availability Factor:</b>	80.6%
<b>Date of Grid Connection:</b>	03 Jun 1980	<b>Cumulative Load Factor:</b>	81.6%
<b>Date of Commercial Operation:</b>	30 Mar 1981	<b>Cumulative Unit Capability Factor:</b>	80.6%
		<b>Cumulative Energy Unavailability Factor:</b>	19.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	3852.3	529.0	98.8	98.8	98.8	98.8	99.2	99.2	7310	99.5
1982	3598.1	529.0	77.4	87.2	77.4	87.2	77.6	87.5	6931	79.1
1983	3671.7	529.0	79.0	84.3	79.0	84.3	79.2	84.6	7056	80.5
1984	3803.5	529.0	81.6	83.6	81.6	83.6	81.9	83.9	7359	83.8
1985	3857.5	529.0	82.9	83.4	82.9	83.4	83.2	83.7	7423	84.7
1986	4631.7	529.0	99.5	86.2	99.5	86.2	99.9	86.5	8760	100.0
1987	3874.4	529.0	83.3	85.8	83.3	85.8	83.6	86.1	7426	84.8
1988	3458.4	529.0	74.2	84.3	74.2	84.3	74.4	84.6	6630	75.5
1989	3241.4	529.0	69.8	82.6	69.8	82.6	69.9	82.9	6230	71.1
1990	4654.8	529.0	100.0	84.4	100.0	84.4	100.4	84.7	8760	100.0
1991	3732.4	529.0	80.2	84.0	80.2	84.0	80.5	84.3	7141	81.5
1992	3480.6	529.0	74.5	83.2	74.5	83.2	74.9	83.5	6638	75.6
1993	3722.3	529.0	79.9	83.0	79.9	83.0	80.3	83.3	7007	80.0
1994	4013.5	529.0	86.2	83.2	86.2	83.2	86.6	83.5	7561	86.3
1995	3784.1	529.0	81.3	83.1	81.3	83.1	81.7	83.4	7225	82.5
1996	3644.7	529.0	78.1	82.7	78.1	82.7	78.4	83.1	6991	79.6
1997	3448.3	529.0	74.1	82.2	74.1	82.2	74.4	82.6	6541	74.7
1998	3701.4	529.0	79.6	82.1	79.6	82.1	79.9	82.4	6978	79.7
1999	4347.9	529.0	93.4	82.7	93.4	82.7	93.8	83.0	8186	93.4
2000	3473.3	529.0	74.4	82.3	74.4	82.3	74.7	82.6	6541	74.5
2001	2216.4	529.0	47.7	80.6	47.7	80.6	47.8	80.9	4177	47.7
2002	4107.5	529.0	86.7	80.9	86.7	80.9	88.6	81.3	7598	86.7
2003	4490.5	529.0	93.7	81.4	93.7	81.4	96.9	82.0	8209	93.7
2004	3848.6	529.0	80.2	81.4	80.2	81.4	82.8	82.0	7052	80.3
2005	3776.2	529.0	78.7	81.3	78.7	81.3	81.5	82.0	6952	79.4
2006	4166.5	529.0	86.8	81.5	86.8	81.5	89.9	82.3	7609	86.9
2007	3327.3	529.0	69.7	81.1	69.7	81.1	71.8	81.9	6153	70.2
2008	3340.5	529.0	69.5	80.6	69.5	80.6	72.1	81.6	6180	70.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					88	
C. Inspection, maintenance or repair combined with refuelling	2624			1521		
Subtotal	2624	0	0	1521	88	0
Total	2624			1609		

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		5
15. Reactor Cooling System:		64
16. Steam generation system:		19
Total	0	88

## 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  
at the beginning of 2008: 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 2008

Net Energy Production: 8259.6 GW(e).h

Energy Availability Factor: 81.5%

Load Factor: 83.7%

Operating Factor: 82.3%

Energy Unavailability Factor: 18.5%

Total Off-line Time: 1549 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	861.1	805.9	858.9	833.2	25.0	0.0	646.4	850.8	829.1	858.9	831.5	858.9	8259.6
EAF (%)	100.0	100.0	100.0	100.0	2.9	0.0	76.2	100.0	100.0	100.0	100.0	100.0	81.5
UCF (%)	100.0	100.0	100.0	100.0	2.9	0.0	76.2	100.0	100.0	100.0	100.0	100.0	81.5
LF (%)	102.7	106.4	102.4	102.8	3.0	0.0	77.1	101.5	102.2	102.3	102.5	102.4	83.7
OF (%)	100.0	103.6	100.0	100.1	3.4	0.0	82.0	100.0	100.0	99.9	100.0	100.0	82.3
EUF (%)	0.0	0.0	0.0	0.0	97.1	100.0	23.8	0.0	0.0	0.0	0.0	0.0	18.5
PUF (%)	0.0	0.0	0.0	0.0	97.1	100.0	23.8	0.0	0.0	0.0	0.0	0.0	18.5
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. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Jun 1988      Lifetime Generation: 131806.0 GW(e).h

Date of First Criticality: 28 May 1993      Cumulative Energy Availability Factor: 84.9%

Date of Grid Connection: 15 Jun 1993      Cumulative Load Factor: 86.0%

Date of Commercial Operation: 18 Mar 1994      Cumulative Unit Capability Factor: 84.9%

   Cumulative Energy Unavailability Factor: 15.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1994	8086.5	1127.0	97.2	97.2	97.2	97.2	97.7	97.7	7146	97.3
1995	7356.3	1127.0	74.1	84.7	74.1	84.7	74.5	85.1	6588	75.2
1996	7444.9	1127.0	74.9	81.2	74.9	81.2	75.2	81.6	6663	75.9
1997	8259.9	1127.0	83.3	81.8	83.3	81.8	83.7	82.1	7358	84.0
1998	9633.1	1127.0	97.1	84.9	97.1	84.9	97.6	85.3	8514	97.2
1999	7999.8	1127.0	80.7	84.2	80.7	84.2	81.0	84.6	7068	80.7
2000	8109.7	1127.0	81.6	83.8	81.6	83.8	81.9	84.2	7164	81.6
2001	8205.1	1127.0	82.7	83.7	82.7	83.7	83.1	84.1	7249	82.8
2002	9561.5	1127.0	96.4	85.1	96.4	85.1	96.9	85.5	8446	96.4
2003	8667.8	1127.0	85.6	85.2	85.6	85.2	87.8	85.7	7497	85.6
2004	8121.1	1127.0	79.9	84.7	79.9	84.7	82.0	85.4	7015	79.9
2005	8658.9	1127.0	85.3	84.7	85.3	84.7	87.7	85.6	7523	85.9
2006	9725.2	1127.0	95.9	85.6	95.9	85.6	98.5	86.6	8401	95.9
2007	7988.3	1127.0	79.1	85.1	79.1	85.1	80.9	86.2	6987	79.8
2008	8259.6	1127.0	81.5	84.9	81.5	84.9	83.7	86.0	7211	82.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1994 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	1580			1186		
Subtotal	1580	0	0	1186	0	0
Total	1580			1186		

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

System	2008 Hours Lost	1994 to 2008 Average Hours Lost Per Year

There were no equipment related outages reported for this period.

**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 at the beginning of 2008: 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 2008**

Net Energy Production: 7696.0 GW(e).h

Energy Availability Factor: 76.5%

Load Factor: 78.0%

Operating Factor: 77.6%

Energy Unavailability Factor: 23.5%

Total Off-line Time: 1963 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	107.2	0.0	206.8	823.2	850.6	653.0	848.6	849.2	825.7	852.9	825.9	852.9	7696.0
EAF (%)	12.6	-3.6	24.7	100.0	100.0	79.4	100.0	100.0	100.0	100.0	100.0	100.0	76.5
UCF (%)	12.6	-3.6	24.7	100.0	100.0	79.4	100.0	100.0	100.0	100.0	100.0	100.0	76.5
LF (%)	12.8	0.0	24.7	101.6	101.4	80.5	101.2	101.3	101.8	101.6	101.8	101.7	78.0
OF (%)	13.0	0.0	30.4	100.1	100.0	82.5	100.0	100.0	100.0	99.9	100.0	100.0	77.6
EUf (%)	87.4	103.6	75.3	0.0	0.0	20.6	0.0	0.0	0.0	0.0	0.0	0.0	23.5
PUf (%)	87.4	103.6	75.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.8
UCLF (%)	0.0	0.0	0.0	0.0	0.0	20.6	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. 2008 Summary of Operation**

THE NUCLEAR REACTOR STOPPED AUTOMATICALLY FOR THE GENERATOR STOP DUE TO THE FLOWING QUANTITY DECREASE IN THE STATOR COOLING WATER SYSTEM.

**5. Historical Summary**

Date of Construction Start: 15 Jul 1992      Lifetime Generation: 100178.0 GW(e).h

Date of First Criticality: 23 Oct 1996      Cumulative Energy Availability Factor: 85.9%

Date of Grid Connection: 12 Nov 1996      Cumulative Load Factor: 86.9%

Date of Commercial Operation: 25 Jul 1997      Cumulative Unit Capability Factor: 85.9%

   Cumulative Energy Unavailability Factor: 14.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1997	4792.1	1127.0	100.0	100.0	100.0	100.0	96.3	96.3	4259	96.4
1998	7634.5	1127.0	76.7	84.5	76.7	84.5	77.3	83.7	6783	77.4
1999	9716.3	1127.0	97.7	89.8	97.7	89.8	98.4	89.6	8559	97.7
2000	8181.2	1127.0	82.0	87.6	82.0	87.6	82.6	87.6	7205	82.0
2001	8107.2	1127.0	81.5	86.2	81.5	86.2	82.1	86.4	7142	81.5
2002	8208.3	1127.0	82.4	85.5	82.4	85.5	83.1	85.8	7217	82.4
2003	9678.7	1127.0	96.1	87.2	96.1	87.2	98.0	87.7	8422	96.1
2004	8330.6	1127.0	82.4	86.5	82.4	86.5	84.2	87.2	7243	82.5
2005	8572.5	1127.0	85.0	86.3	85.0	86.3	86.8	87.2	7499	85.6
2006	7765.6	1127.0	77.0	85.4	77.0	85.4	78.7	86.3	6813	77.8
2007	10025.3	1127.0	100.0	86.8	100.0	86.8	101.5	87.7	8760	100.0
2008	7696.0	1127.0	76.5	85.9	76.5	85.9	78.0	86.9	6797	77.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1998 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure C. Inspection, maintenance or repair combined with refuelling	1868	126		1052	48	
Subtotal	1868	126	0	1052	48	0
Total	1994			1100		

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

System	2008 Hours Lost	1998 to 2008 Average Hours Lost Per Year
15. Reactor Cooling System:		20
41. Main Generator System:	126	27
Total	126	47

## JP-11 HAMAOKA-1

**Operator:** CHUBU (CHUBU ELECTRIC POWER CO.,INC.)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 515.0 MW(e)  
**Design Net Capacity:** 516.0 MW(e)  
**Design Discharge Burnup:** 27500 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** -0.3%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.3%  
**Total Off-line Time:** 8760 hours

### 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
<b>UCF (%)</b>	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
<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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<b>PUF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<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. 2008 Summary of Operation

EXTENDED OUTAGE THROUGHOUT THE YEAR IN ORDER TO PLACE THE CORE SHROUD AND PLR-PIPING.

## 5. Historical Summary

<b>Date of Construction Start:</b>	10 Jun 1971	<b>Lifetime Generation:</b>	73631.0 GW(e).h
<b>Date of First Criticality:</b>	20 Jun 1974	<b>Cumulative Energy Availability Factor:</b>	48.4%
<b>Date of Grid Connection:</b>	13 Aug 1974	<b>Cumulative Load Factor:</b>	48.0%
<b>Date of Commercial Operation:</b>	17 Mar 1976	<b>Cumulative Unit Capability Factor:</b>	48.4%
		<b>Cumulative Energy Unavailability Factor:</b>	51.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976	2050.0	515.0	54.2	54.2	54.2	54.2	54.2	54.2	4635	63.1
1977	2250.5	515.0	49.9	51.9	49.9	51.9	49.9	51.9	5194	59.3
1978	55.9	515.0	1.2	34.0	1.2	34.0	1.2	34.0	283	3.2
1979	3059.0	515.0	67.8	42.8	67.8	42.8	67.8	42.8	6980	79.7
1980	3051.9	515.0	67.5	47.9	67.5	47.9	67.5	47.9	6916	78.7
1981	2394.2	515.0	53.1	48.8	53.1	48.8	53.1	48.8	5052	57.7
1982	2997.6	515.0	66.6	51.4	66.6	51.4	66.4	51.4	6237	71.2
1983	3054.9	515.0	67.7	53.5	67.7	53.5	67.7	53.5	6236	71.2
1984	2377.5	515.0	53.6	53.5	53.6	53.5	52.6	53.4	4822	54.9
1985	4437.1	515.0	100.0	58.2	100.0	58.2	98.4	57.9	8760	100.0
1986	2919.8	515.0	65.0	58.9	65.0	58.9	64.7	58.6	5804	66.3
1987	3290.7	515.0	73.1	60.1	73.1	60.1	72.9	59.8	6560	74.9
1988	1838.7	515.0	40.7	58.6	40.7	58.6	40.6	58.3	3649	41.5
1989	1950.7	515.0	43.4	57.5	43.4	57.5	43.2	57.2	3904	44.6
1990	2040.6	515.0	49.0	56.9	49.0	56.9	45.2	56.4	4015	45.8
1991	2162.8	515.0	48.3	56.3	48.2	56.3	47.9	55.9	4319	49.3
1992	2730.1	515.0	60.7	56.6	60.7	56.6	60.3	56.1	5384	61.3
1993	2872.6	515.0	64.4	57.0	64.1	57.0	63.7	56.5	5681	64.9
1994	1642.1	515.0	36.6	56.0	36.6	55.9	36.4	55.5	3216	36.7
1995	3499.6	515.0	78.1	57.1	78.1	57.1	77.6	56.6	6892	78.7
1996	3662.3	515.0	81.4	58.2	81.4	58.2	81.0	57.8	7158	81.5
1997	4118.0	515.0	92.1	59.8	91.9	59.8	91.3	59.3	8086	92.3
1998	3609.8	515.0	80.5	60.7	80.5	60.7	80.0	60.2	7070	80.7
1999	2878.7	515.0	64.2	60.9	64.2	60.8	63.8	60.4	5630	64.3
2000	3198.0	515.0	71.3	61.3	71.2	61.2	70.7	60.8	6268	71.4
2001	3069.8	515.0	68.5	61.6	68.5	61.5	68.0	61.1	6000	68.5
2002	0.0	515.0	0.0	59.3	0.0	59.2	0.0	58.8	0	0.0
2003	0.0	515.0	0.0	57.1	0.0	57.1	0.0	56.7	0	0.0
2004	0.0	515.0	0.0	55.1	0.0	55.1	0.0	54.7	0	0.0
2005	0.0	515.0	0.0	53.3	0.0	53.3	0.0	52.9	0	0.0
2006	0.0	515.0	0.0	51.6	0.0	51.5	0.0	51.2	0	0.0
2007	0.0	515.0	0.0	50.0	0.0	49.9	0.0	49.5	0	0.0
2008	0.0	515.0	-0.3	48.4	-0.3	48.4	0.0	48.0	0	0.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					1072	
C. Inspection, maintenance or repair combined with refuelling	8784			2817		
D. Inspection, maintenance or repair without refuelling				88		
E. Testing of plant systems or component:				0		
Subtotal	8784	0	0	2905	1072	0
Total	8784			3977		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		598
12. Reactor I&C Systems		181
13. Reactor Auxiliary System:		116
15. Reactor Cooling System:		155
21. Fuel Handling and Storage Facilities		15
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		5
Total	0	1070

## JP-24 HAMAOKA-2

**Operator:** CHUBU (CHUBU ELECTRIC POWER CO.,INC.)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 806.0 MW(e)  
**Design Net Capacity:** 814.0 MW(e)  
**Design Discharge Burnup:** 27500 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** -0.3%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.3%  
**Total Off-line Time:** 8760 hours

### 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
<b>UCF (%)</b>	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
<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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<b>PUF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<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. 2008 Summary of Operation

EXTENDED OUTAGE THROUGHOUT THE YEAR IN ORDER TO PLACE THE CORE SHROUD AND PLR-PIPING.

## 5. Historical Summary

<b>Date of Construction Start:</b>	14 Jun 1974	<b>Lifetime Generation:</b>	129570.0 GW(e).h
<b>Date of First Criticality:</b>	28 Mar 1978	<b>Cumulative Energy Availability Factor:</b>	59.7%
<b>Date of Grid Connection:</b>	04 May 1978	<b>Cumulative Load Factor:</b>	59.8%
<b>Date of Commercial Operation:</b>	29 Nov 1978	<b>Cumulative Unit Capability Factor:</b>	59.8%
		<b>Cumulative Energy Unavailability Factor:</b>	40.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	1048.6	812.0	88.0	88.0	88.0	88.0	88.0	88.0	1351	92.3
1979	4364.5	814.0	61.2	65.1	61.2	65.1	61.2	65.0	5905	67.4
1980	4709.3	814.0	65.9	65.4	65.9	65.4	65.9	65.4	6261	71.3
1981	5037.4	814.0	70.7	67.1	70.7	67.1	70.6	67.1	6527	74.5
1982	6223.6	814.0	87.3	71.9	87.3	71.9	87.3	71.9	8074	92.2
1983	4888.1	814.0	68.6	71.3	68.6	71.3	68.6	71.3	6250	71.3
1984	4693.8	815.0	66.3	70.5	66.3	70.5	65.6	70.3	5877	66.9
1985	4397.2	815.0	62.5	69.4	62.5	69.4	61.6	69.1	5553	63.4
1986	4845.5	815.0	68.1	69.2	68.1	69.2	67.9	69.0	6145	70.1
1987	7002.0	815.0	98.7	72.4	98.7	72.4	98.1	72.1	8760	100.0
1988	4015.9	815.0	56.4	70.8	56.4	70.8	56.1	70.6	5108	58.2
1989	4613.0	806.0	64.4	70.3	64.4	70.3	65.3	70.1	5864	66.9
1990	5828.1	806.0	82.2	71.2	82.2	71.2	82.5	71.1	7289	83.2
1991	5299.5	806.0	74.7	71.5	74.7	71.5	75.1	71.4	6625	75.6
1992	4319.6	806.0	60.6	70.7	60.6	70.7	61.0	70.7	5421	61.7
1993	5347.9	806.0	75.3	71.0	75.3	71.0	75.7	71.0	6657	76.0
1994	4537.8	806.0	64.1	70.6	64.1	70.6	64.3	70.6	5643	64.4
1995	6922.2	806.0	97.8	72.2	97.7	72.2	98.0	72.2	8577	97.9
1996	6152.7	806.0	86.5	73.0	86.5	73.0	86.9	73.0	7613	86.7
1997	5106.5	806.0	72.2	72.9	72.1	72.9	72.3	73.0	6350	72.5
1998	5191.8	806.0	73.4	73.0	73.2	72.9	73.5	73.0	6462	73.8
1999	5221.5	806.0	74.0	73.0	73.6	73.0	74.0	73.0	6481	74.0
2000	4972.9	806.0	70.0	72.9	69.9	72.8	70.2	72.9	6146	70.0
2001	5134.2	806.0	72.6	72.9	72.2	72.8	72.7	72.9	6362	72.6
2002	164.0	806.0	2.3	70.0	2.3	69.9	2.3	70.0	198	2.3
2003	6950.1	806.0	98.1	71.1	97.8	71.0	98.4	71.1	8617	98.4
2004	951.3	806.0	14.0	68.9	13.3	68.8	13.4	68.9	1225	13.9
2005	0.0	806.0	0.0	66.4	0.0	66.3	0.0	66.4	0	0.0
2006	0.0	806.0	0.0	64.0	0.0	63.9	0.0	64.0	0	0.0
2007	0.0	806.0	0.0	61.8	0.0	61.8	0.0	61.9	0	0.0
2008	0.0	806.0	-0.3	59.8	-0.3	59.7	0.0	59.8	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					88	
C. Inspection, maintenance or repair combined with refuelling	8784			2605		
D. Inspection, maintenance or repair without refuelling				106		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					37	
Z. Others					210	
Subtotal	8784	0	0	2711	335	0
Total	8784			3046		

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		58
32. Feedwater and Main Steam System		29
XX. Miscellaneous Systems		0
Total	0	87

# JP-36 HAMAOKA-3

Operator: CHUBU (CHUBU ELECTRIC POWER CO.,INC.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 6882.9 GW(e).h  
 Energy Availability Factor: 74.0%  
 Load Factor: 74.4%  
 Operating Factor: 75.6%  
 Energy Unavailability Factor: 26.0%  
 Total Off-line Time: 2135 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	382.8	0.0	0.0	270.3	790.3	764.4	787.6	784.8	759.8	787.6	764.3	791.0	6882.9
EAF (%)	49.4	-3.6	0.0	35.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	74.0
UCF (%)	58.4	-3.6	0.0	35.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	74.7
LF (%)	48.7	0.0	0.0	35.6	100.6	100.5	100.3	99.9	99.9	100.1	100.5	100.7	74.4
OF (%)	58.9	0.0	0.0	42.7	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	75.6
EUF (%)	50.6	103.6	100.0	64.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0
PUF (%)	41.6	103.6	100.0	50.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.1
UCLF (%)	0.0	0.0	0.0	13.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
XUF (%)	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

BASE LOAD OPERATION AT RATED THERMAL POWER

## 5. Historical Summary

Date of Construction Start: 18 Apr 1983      Lifetime Generation: 156232.0 GW(e).h  
 Date of First Criticality: 21 Nov 1986      Cumulative Energy Availability Factor: 78.1%  
 Date of Grid Connection: 20 Jan 1987      Cumulative Load Factor: 77.4%  
 Date of Commercial Operation: 28 Aug 1987      Cumulative Unit Capability Factor: 78.2%  
    Cumulative Energy Unavailability Factor: 21.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	3622.6	1066.0	99.5	99.5	99.5	99.5	92.5	92.5	3470	94.5
1988	7066.8	1066.0	75.8	82.8	75.8	82.8	75.5	80.5	6862	78.1
1989	8542.0	1066.0	92.4	86.7	92.4	86.7	91.5	85.0	8167	93.2
1990	6601.3	1056.0	71.4	82.3	71.4	82.3	71.4	81.1	6366	72.7
1991	6763.1	1056.0	73.5	80.3	73.5	80.3	73.1	79.3	6472	73.9
1992	6585.4	1056.0	71.7	78.7	71.4	78.7	71.0	77.8	6371	72.5
1993	8768.0	1056.0	95.3	81.3	95.3	81.2	94.8	80.4	8359	95.4
1994	6490.5	1056.0	77.4	80.8	77.4	80.7	70.2	79.0	6784	77.4
1995	7725.7	1056.0	84.6	81.2	84.1	81.1	83.5	79.6	7429	84.8
1996	6891.6	1056.0	74.8	80.6	74.7	80.4	74.3	79.0	6573	74.8
1997	8109.7	1056.0	88.3	81.3	88.3	81.2	87.7	79.8	7863	89.8
1998	9200.7	1056.0	100.0	82.9	100.0	82.8	99.5	81.5	8760	100.0
1999	7618.3	1056.0	82.8	82.9	82.8	82.8	82.4	81.6	7255	82.8
2000	7706.0	1056.0	83.6	83.0	83.6	82.9	83.1	81.7	7340	83.6
2001	6476.8	1056.0	70.4	82.1	70.4	82.0	70.0	80.9	6171	70.4
2002	6350.9	1056.0	69.0	81.3	69.0	81.2	68.7	80.1	6044	69.0
2003	1486.6	1056.0	16.1	77.3	16.1	77.2	16.1	76.2	1403	16.0
2004	9342.5	1056.0	100.0	78.6	100.0	78.5	100.7	77.6	8784	100.0
2005	5793.4	1056.0	62.2	77.7	62.1	77.7	62.6	76.8	5473	62.5
2006	6396.9	1056.0	69.2	77.3	68.7	77.2	69.2	76.4	6081	69.4
2007	9196.5	1056.0	100.0	78.4	99.2	78.3	99.4	77.5	8760	100.0
2008	6882.9	1056.0	74.7	78.2	74.0	78.1	74.4	77.4	6625	75.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		84			204	
C. Inspection, maintenance or repair combined with refuelling	2090			1322		
D. Inspection, maintenance or repair without refuelling				31		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					5	
Z. Others					166	
Subtotal	2090	84	0	1353	375	0
Total		2174			1728	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		177
31. Turbine and auxiliaries	84	
35. All other I&C Systems		0
Total	84	177

## JP-49 HAMAOKA-4

**Operator:** CHUBU (CHUBU ELECTRIC POWER CO.,INC.)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 9293.6 GW(e).h  
**Energy Availability Factor:** 96.5%  
**Load Factor:** 97.2%  
**Operating Factor:** 97.2%  
**Energy Unavailability Factor:** 3.5%  
**Total Off-line Time:** 248 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	820.0	763.8	815.8	682.9	693.7	791.3	812.5	703.7	785.6	814.9	791.0	818.3	9293.6
<b>EAF (%)</b>	100.0	99.9	100.0	86.7	84.9	100.0	99.7	86.7	100.0	100.0	100.0	100.0	96.5
<b>UCF (%)</b>	100.0	99.9	100.0	86.7	84.9	100.0	99.7	86.7	100.0	100.0	100.0	100.0	96.5
<b>LF (%)</b>	100.9	104.1	100.4	87.0	85.4	100.6	100.0	86.6	99.9	100.2	100.6	100.7	97.2
<b>OF (%)</b>	100.0	103.6	100.0	87.5	86.6	100.0	100.0	89.1	100.0	99.9	100.0	100.0	97.2
<b>EUF (%)</b>	0.0	0.1	0.0	13.3	15.1	0.0	0.3	13.3	0.0	0.0	0.0	0.0	3.5
<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	0.1	0.0	13.3	15.1	0.0	0.3	13.2	0.0	0.0	0.0	0.0	3.5
<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. 2008 Summary of Operation

BASE LOAD OPERATION AT RATED THERMAL POWER

## 5. Historical Summary

<b>Date of Construction Start:</b>	13 Oct 1989	<b>Lifetime Generation:</b>	123014.0 GW(e).h
<b>Date of First Criticality:</b>	02 Dec 1992	<b>Cumulative Energy Availability Factor:</b>	82.0%
<b>Date of Grid Connection:</b>	27 Jan 1993	<b>Cumulative Load Factor:</b>	82.0%
<b>Date of Commercial Operation:</b>	03 Sep 1993	<b>Cumulative Unit Capability Factor:</b>	82.1%
		<b>Cumulative Energy Unavailability Factor:</b>	18.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1993	3186.2	1092.0	99.9	99.9	99.9	99.9	99.7	99.7	2928	100.0
1994	7110.4	1092.0	74.9	81.2	74.7	81.0	74.3	80.7	6576	75.1
1995	9546.0	1092.0	100.0	89.2	100.0	89.1	99.8	88.9	8760	100.0
1996	8301.3	1092.0	86.7	88.5	86.7	88.4	86.5	88.2	7615	86.7
1997	7883.0	1092.0	83.1	87.2	82.6	87.1	82.4	86.8	7302	83.4
1998	7154.1	1092.0	74.9	84.9	74.9	84.8	74.8	84.6	6604	75.4
1999	9545.1	1092.0	99.9	87.3	99.9	87.2	99.8	87.0	8760	100.0
2000	8233.7	1092.0	86.3	87.2	86.0	87.0	85.8	86.8	7577	86.3
2001	8773.5	1092.0	91.8	87.7	91.8	87.6	91.7	87.4	8046	91.8
2002	6436.4	1092.0	67.4	85.5	67.4	85.4	67.3	85.3	5906	67.4
2003	3729.8	1092.0	39.1	81.1	39.1	81.0	39.0	80.8	3415	39.0
2004	7279.7	1092.0	75.8	80.6	75.8	80.5	75.9	80.3	6668	75.9
2005	9595.6	1092.0	100.0	82.2	100.0	82.1	100.3	82.0	8760	100.0
2006	6523.5	1092.0	68.2	81.1	68.2	81.0	68.2	80.9	6423	73.3
2007	7720.9	1092.0	80.6	81.1	80.5	81.0	80.7	80.9	7098	81.0
2008	9293.6	1092.0	96.5	82.1	96.5	82.0	97.2	82.0	8512	97.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1994 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		272			377	
C. Inspection, maintenance or repair combined with refuelling				1059		
D. Inspection, maintenance or repair without refuelling				40		
Z. Others					70	
Subtotal	0	272	0	1099	447	0
Total		272			1546	

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

System	2008 Hours Lost	1994 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		349
13. Reactor Auxiliary System:		26
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System	272	
Total	272	376

# JP-60 HAMAOKA-5

Operator: CHUBU (CHUBU ELECTRIC POWER CO.,INC.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1212.0 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 2008

Net Energy Production: 7516.3 GW(e).h  
 Energy Availability Factor: 68.3%  
 Load Factor: 70.6%  
 Operating Factor: 69.2%  
 Energy Unavailability Factor: 31.7%  
 Total Off-line Time: 2709 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	939.2	878.6	938.9	907.1	935.7	904.3	929.5	880.8	179.8	0.0	14.9	7.4	7516.3
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.1	20.7	0.0	1.7	0.9	68.3
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	23.4	0.0	1.7	0.9	68.8
LF (%)	104.2	104.2	104.1	104.0	103.8	103.6	103.1	97.7	20.6	0.0	1.7	0.8	70.6
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	24.3	0.0	3.9	2.2	69.2
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	79.3	100.0	98.3	99.1	31.7
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.6	100.0	13.8	0.0	15.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84.4	99.1	15.3
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	2.7	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

POWER LOSS DUE TO INSERTION OF LP TURBIN PRESSURE DROP PLATES. SHUTDOWN DUE TO HIGH HYDROGEN CONCENTRATION IN CONDENSER OFF SYSTEM.

## 5. Historical Summary

Date of Construction Start: 12 Jul 2000      Lifetime Generation: 34152.0 GW(e).h  
 Date of First Criticality: 23 Mar 2004      Cumulative Energy Availability Factor: 65.6%  
 Date of Grid Connection: 26 Apr 2004      Cumulative Load Factor: 66.9%  
 Date of Commercial Operation: 18 Jan 2005      Cumulative Unit Capability Factor: 65.7%  
    Cumulative Energy Unavailability Factor: 34.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2005	11870.4	1325.0	100.0	100.0	100.0	100.0	102.3	102.3	8760	100.0
2006	3385.2	1325.0	28.5	64.3	28.5	64.3	29.2	65.7	2515	28.7
2007	7652.5	1325.0	65.9	64.8	65.9	64.8	65.9	65.8	6159	70.3
2008	7516.3	1212.0	68.8	65.7	68.3	65.6	70.6	66.9	6075	69.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2006 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure C. Inspection, maintenance or repair combined with refuelling	1381	1336		1001	1949	
Subtotal	1381	1336	0	1001	1949	0
Total	2717			2950		

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

System	2008 Hours Lost	2006 to 2008 Average Hours Lost Per Year
31. Turbine and auxiliaries	1336	1949
Total	1336	1949



# 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 6274.8 GW(e).h  
 Energy Availability Factor: 67.2%  
 Load Factor: 67.1%  
 Operating Factor: 67.9%  
 Energy Unavailability Factor: 32.8%  
 Total Off-line Time: 2813 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	790.4	739.2	529.7	0.0	0.0	0.0	318.8	789.7	763.7	790.0	764.4	788.8	6274.8
EAF (%)	100.0	100.0	67.1	-0.1	0.0	0.0	40.5	100.0	100.0	100.0	100.0	100.0	67.2
UCF (%)	100.0	100.0	67.1	-0.1	0.0	0.0	40.5	100.0	100.0	100.0	100.0	100.0	67.2
LF (%)	99.6	103.1	66.7	0.0	0.0	0.0	40.2	99.5	99.4	99.4	99.5	99.4	67.1
OF (%)	100.0	103.6	67.9	0.0	0.0	0.0	44.4	100.0	100.0	99.9	100.0	100.0	67.9
EUF (%)	0.0	0.0	32.9	100.1	100.0	100.0	59.5	0.0	0.0	0.0	0.0	0.0	32.8
PUF (%)	0.0	0.0	32.9	100.1	100.0	100.0	59.5	0.0	0.0	0.0	0.0	0.0	32.8
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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2008/3/21-2008/7/22)OPERATION AT FULL POWER IN BASE  
 LOAD.(2008/7/22-)

## 5. Historical Summary

Date of Construction Start: 07 Nov 2000 Lifetime Generation: 24623.0 GW(e).h  
 Date of First Criticality: 24 Jan 2005 Cumulative Energy Availability Factor: 78.3%  
 Date of Grid Connection: 09 Mar 2005 Cumulative Load Factor: 77.4%  
 Date of Commercial Operation: 08 Dec 2005 Cumulative Unit Capability Factor: 78.4%  
 Cumulative Energy Unavailability Factor: 21.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2005	610.5	1067.0	100.0	100.0	100.0	100.0	76.9	76.9	576	77.4
2006	9269.3	1067.0	100.0	100.0	99.7	99.8	99.2	97.4	8760	100.0
2007	6150.8	1067.0	66.2	83.8	66.2	83.7	65.8	82.3	5827	66.5
2008	6274.8	1067.0	67.2	78.4	67.2	78.3	67.1	77.4	5947	67.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2006 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
C. Inspection, maintenance or repair combined with refuelling	2846			719	261	
Subtotal	2846	0	0	719	261	0
Total	2846			980		

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

System	2008 Hours Lost	2006 to 2008 Average Hours Lost Per Year

There were no equipment related outages reported for this period.

## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3980.2 GW(e).h  
**Energy Availability Factor:** 83.7%  
**Load Factor:** 84.5%  
**Operating Factor:** 84.5%  
**Energy Unavailability Factor:** 16.3%  
**Total Off-line Time:** 1357 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	406.4	380.0	407.8	326.0	0.0	97.6	400.9	393.1	379.7	397.3	387.1	404.4	3980.2
<b>EAF (%)</b>	100.0	99.6	100.0	83.1	0.1	25.3	100.0	98.6	98.4	99.5	100.0	100.0	83.7
<b>UCF (%)</b>	100.0	99.6	100.0	83.1	0.1	25.3	100.0	100.0	100.0	100.0	100.0	100.0	84.0
<b>LF (%)</b>	101.5	105.1	101.9	84.3	0.0	25.2	100.1	98.2	98.0	99.1	99.9	101.0	84.5
<b>OF (%)</b>	100.0	103.6	100.0	83.4	0.0	28.2	100.0	100.0	100.0	99.9	100.0	100.0	84.5
<b>EUF (%)</b>	0.0	0.4	0.0	16.9	99.9	74.7	0.0	1.4	1.6	0.5	0.0	0.0	16.3
<b>PUF (%)</b>	0.0	0.0	0.0	16.9	99.9	74.7	0.0	0.0	0.0	0.0	0.0	0.0	16.0
<b>UCLF (%)</b>	0.0	0.4	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	1.4	1.6	0.5	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2008/4/26-2008/6/22)

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Sep 1973	<b>Lifetime Generation:</b>	115446.0 GW(e).h
<b>Date of First Criticality:</b>	29 Jan 1977	<b>Cumulative Energy Availability Factor:</b>	78.2%
<b>Date of Grid Connection:</b>	17 Feb 1977	<b>Cumulative Load Factor:</b>	78.2%
<b>Date of Commercial Operation:</b>	30 Sep 1977	<b>Cumulative Unit Capability Factor:</b>	78.2%
		<b>Cumulative Energy Unavailability Factor:</b>	21.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	1299.7	538.0	82.5	82.5	82.5	82.5	82.5	82.5	2680	91.5
1978	3138.0	538.0	66.6	70.6	66.6	70.6	66.6	70.6	6272	71.6
1979	2564.5	538.0	54.4	63.7	54.4	63.7	54.4	63.7	4984	56.9
1980	3127.4	538.0	66.2	64.4	66.2	64.4	66.2	64.4	6006	68.4
1981	3236.8	538.0	68.7	65.4	68.7	65.4	68.7	65.4	6253	71.4
1982	3527.3	538.0	74.8	67.2	74.8	67.2	74.8	67.2	6662	76.1
1983	4667.6	538.0	99.0	72.2	99.0	72.2	99.0	72.2	8754	99.9
1984	3318.2	538.0	70.5	72.0	70.5	72.0	70.2	71.9	6283	71.5
1985	3674.1	538.0	78.2	72.7	78.2	72.7	78.0	72.6	6962	79.5
1986	3719.6	538.0	79.2	73.4	79.2	73.4	78.9	73.3	7044	80.4
1987	4696.0	538.0	100.0	76.0	100.0	76.0	99.6	75.9	8760	100.0
1988	3533.9	538.0	75.0	75.9	75.0	75.9	74.8	75.8	6719	76.5
1989	3563.6	538.0	76.2	75.9	76.2	75.9	75.6	75.8	6791	77.5
1990	3632.2	538.0	76.4	75.9	76.4	75.9	77.1	75.9	6932	79.1
1991	4382.4	538.0	93.4	77.2	93.4	77.2	93.0	77.0	8184	93.4
1992	3675.4	538.0	78.5	77.3	78.5	77.3	77.8	77.1	6995	79.6
1993	3494.2	538.0	74.4	77.1	74.4	77.1	74.1	76.9	6630	75.7
1994	3601.3	538.0	76.6	77.0	76.6	77.0	76.4	76.9	6717	76.7
1995	3598.7	538.0	76.5	77.0	76.5	77.0	76.4	76.9	6815	77.8
1996	3579.1	538.0	75.9	77.0	75.9	77.0	75.7	76.8	6768	77.0
1997	4688.9	538.0	99.7	78.1	99.7	78.1	99.5	77.9	8760	100.0
1998	3239.2	538.0	68.9	77.7	68.9	77.7	68.7	77.5	6127	69.9
1999	3783.2	538.0	80.4	77.8	80.4	77.8	80.3	77.6	7051	80.5
2000	3194.1	538.0	67.7	77.3	67.7	77.3	67.6	77.2	5953	67.8
2001	4477.6	538.0	95.2	78.1	95.2	78.1	95.0	77.9	8412	96.0
2002	3527.9	538.0	74.2	77.9	74.2	77.9	74.9	77.8	6505	74.3
2003	3734.6	538.0	77.8	77.9	77.8	77.9	79.2	77.8	6819	77.8
2004	3249.6	538.0	67.6	77.5	67.6	77.5	68.8	77.5	5949	67.7
2005	4267.9	538.0	90.3	78.0	90.1	78.0	90.6	78.0	7949	90.7
2006	3461.2	538.0	73.2	77.8	73.2	77.8	73.4	77.8	6465	73.8
2007	3919.4	538.0	82.6	78.0	82.5	78.0	83.2	78.0	7259	82.9
2008	3980.2	538.0	84.0	78.2	83.7	78.2	84.5	78.2	7403	84.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					54	
C. Inspection, maintenance or repair combined with refuelling	1381			1643		
D. Inspection, maintenance or repair without refuelling				12		
J. Grid limitation, failure or grid unavailability						0
Z. Others					15	
Subtotal	1381	0	0	1655	69	0
Total		1381			1724	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		19
31. Turbine and auxiliaries		29
42. Electrical Power Supply System		0
Total	0	53

## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3897.6 GW(e).h  
**Energy Availability Factor:** 82.2%  
**Load Factor:** 82.7%  
**Operating Factor:** 83.2%  
**Energy Unavailability Factor:** 17.8%  
**Total Off-line Time:** 1475 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	207.7	0.0	147.5	392.9	404.4	386.5	399.0	393.8	381.2	395.9	386.1	402.5	3897.6
<b>EAF (%)</b>	51.4	-3.5	36.8	100.0	100.0	99.7	99.9	98.7	98.7	99.2	99.9	100.0	82.2
<b>UCF (%)</b>	51.4	-3.5	36.8	100.0	100.0	99.7	100.0	100.0	100.0	100.0	100.0	100.0	82.5
<b>LF (%)</b>	51.9	0.0	36.9	101.6	101.0	99.8	99.7	98.4	98.4	98.8	99.7	100.6	82.7
<b>OF (%)</b>	51.6	0.0	40.5	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	83.2
<b>EUF (%)</b>	48.6	103.5	63.2	0.0	0.0	0.3	0.1	1.3	1.3	0.8	0.1	0.0	17.8
<b>PUF (%)</b>	48.6	103.5	41.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.6
<b>UCLF (%)</b>	0.0	0.0	21.5	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	1.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.3	1.3	0.8	0.1	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2008/1/17-2008/3/19)

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1978  
**Date of First Criticality:** 31 Jul 1981  
**Date of Grid Connection:** 19 Aug 1981  
**Date of Commercial Operation:** 19 Mar 1982

**Lifetime Generation:** 104133.0 GW(e).h  
**Cumulative Energy Availability Factor:** 82.4%  
**Cumulative Load Factor:** 82.4%  
**Cumulative Unit Capability Factor:** 82.5%  
**Cumulative Energy Unavailability Factor:** 17.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1982	3893.9	538.0	98.6	98.6	98.6	98.6	98.6	98.6	7327	99.8
1983	3575.0	538.0	75.9	86.2	75.9	86.2	75.9	86.2	6798	77.6
1984	3776.6	538.0	80.3	84.1	80.1	84.1	79.9	84.0	7157	81.5
1985	3694.1	538.0	78.6	82.7	78.6	82.6	78.4	82.5	6995	79.9
1986	4698.6	538.0	100.0	86.3	100.0	86.2	99.7	86.1	8760	100.0
1987	3758.7	538.0	80.5	85.3	80.5	85.3	79.8	85.0	7137	81.5
1988	3541.5	538.0	75.1	83.8	75.1	83.8	74.9	83.5	6743	76.8
1989	3751.3	538.0	79.8	83.3	79.8	83.3	79.6	83.0	7128	81.4
1990	4694.9	538.0	99.9	85.2	99.9	85.2	99.6	84.9	8760	100.0
1991	3526.2	538.0	75.2	84.2	75.2	84.1	74.8	83.9	6731	76.8
1992	3479.9	538.0	74.3	83.3	74.3	83.2	73.6	82.9	6639	75.6
1993	3588.6	538.0	76.4	82.7	76.4	82.7	76.1	82.4	6799	77.6
1994	4700.6	538.0	99.9	84.0	99.9	84.0	99.7	83.7	8760	100.0
1995	3720.9	538.0	79.0	83.7	79.0	83.6	79.0	83.4	7014	80.1
1996	3664.8	538.0	77.7	83.3	77.7	83.2	77.5	83.0	6935	79.0
1997	3610.4	538.0	76.8	82.8	76.8	82.8	76.6	82.6	6831	78.0
1998	4701.1	538.0	99.9	83.9	99.9	83.8	99.7	83.6	8760	100.0
1999	3734.4	538.0	79.5	83.6	79.5	83.6	79.2	83.3	6973	79.6
2000	3695.0	538.0	78.3	83.3	78.3	83.3	78.2	83.1	6888	78.4
2001	3145.7	538.0	66.9	82.5	66.9	82.5	66.7	82.2	5875	67.1
2002	4718.5	538.0	99.2	83.3	99.2	83.3	100.1	83.1	8698	99.3
2003	3904.7	538.0	81.6	83.2	81.6	83.2	82.9	83.1	7150	81.6
2004	3611.9	538.0	76.1	82.9	75.8	82.9	76.4	82.8	6683	76.1
2005	3163.3	538.0	67.1	82.3	67.0	82.2	67.1	82.1	5890	67.2
2006	3329.2	538.0	70.4	81.8	70.3	81.8	70.6	81.7	6230	71.1
2007	4720.6	538.0	100.0	82.5	99.8	82.4	100.2	82.4	8760	100.0
2008	3897.6	538.0	82.5	82.5	82.2	82.4	82.7	82.4	7285	83.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		156			3	
C. Inspection, maintenance or repair combined with refuelling	1344			1419		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				5		
J. Grid limitation, failure or grid unavailability						0
Subtotal	1344	156	0	1424	3	0
Total		1500			1427	

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		0
31. Turbine and auxiliaries	156	2
Total	156	2

**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  
 at the beginning of 2008: 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 2008**

Net Energy Production: 6393.0 GW(e).h  
 Energy Availability Factor: 82.5%  
 Load Factor: 86.3%  
 Operating Factor: 83.1%  
 Energy Unavailability Factor: 17.5%  
 Total Off-line Time: 1478 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	657.5	614.6	656.7	636.4	657.3	635.0	653.6	651.1	124.2	0.0	447.9	658.8	6393.0
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	19.8	0.2	70.7	100.0	82.5
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	19.8	0.2	70.7	100.0	82.5
LF (%)	104.5	108.1	104.3	104.6	104.4	104.2	103.8	103.4	20.4	0.0	73.5	104.7	86.3
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	20.0	0.0	74.7	100.0	83.1
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.2	99.8	29.3	0.0	17.5
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.2	99.8	29.3	0.0	17.5
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. 2008 Summary of Operation**

PERIODICAL INSPECTION AND REFUELING.(2008/9/7-2008/11/8)

**5. Historical Summary**

Date of Construction Start: 01 Oct 1990      Lifetime Generation: 91361.0 GW(e).h  
 Date of First Criticality: 23 Feb 1994      Cumulative Energy Availability Factor: 85.4%  
 Date of Grid Connection: 29 Mar 1994      Cumulative Load Factor: 87.7%  
 Date of Commercial Operation: 15 Dec 1994      Cumulative Unit Capability Factor: 85.4%  
    Cumulative Energy Unavailability Factor: 14.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1994	636.8	846.0	100.0	100.0	100.0	100.0	101.2	101.2	744	100.0
1995	7491.8	846.0	100.0	100.0	100.0	100.0	101.1	101.1	8760	100.0
1996	5578.2	846.0	74.2	87.6	74.2	87.6	75.1	88.6	6621	75.4
1997	6134.7	846.0	81.9	85.8	81.9	85.8	82.8	86.7	7242	82.7
1998	6250.4	846.0	83.4	85.2	83.4	85.2	84.3	86.1	7374	84.2
1999	6298.4	846.0	84.1	85.0	84.1	85.0	85.0	85.9	7368	84.1
2000	6660.3	846.0	88.7	85.6	88.7	85.6	89.6	86.5	7790	88.7
2001	6210.7	846.0	82.9	85.2	82.9	85.2	83.8	86.1	7267	83.0
2002	6599.5	846.0	85.8	85.3	85.8	85.3	89.1	86.5	7518	85.8
2003	5862.1	846.0	74.9	84.1	74.9	84.1	79.1	85.7	6560	74.9
2004	7828.9	846.0	100.0	85.7	100.0	85.7	105.4	87.6	8784	100.0
2005	6699.4	846.0	86.8	85.8	86.8	85.8	90.4	87.9	7637	87.2
2006	6134.6	846.0	79.5	85.3	79.5	85.3	82.8	87.5	6990	79.8
2007	6869.3	846.0	88.9	85.6	88.9	85.6	92.7	87.9	7813	89.2
2008	6393.0	846.0	82.5	85.4	82.5	85.4	86.3	87.7	7282	83.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1996 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure C. Inspection, maintenance or repair combined with refuelling	1506			1163	90	
Subtotal	1506	0	0	1163	90	0
Total	1506			1253		

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

System	2008 Hours Lost	1996 to 2008 Average Hours Lost Per Year
41. Main Generator System:		18
42. Electrical Power Supply System:		72
Total	0	90

# JP-33 KASHIWAZAKI KARIWA-1

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 39500 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: -0.3%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.3%  
 Total Off-line Time: 8760 hours

## 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
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. 2008 Summary of Operation

PLANT INSPECTION AFTER EARTHQUAKE IN JULY 2007.

## 5. Historical Summary

Date of Construction Start: 05 Jun 1980      Lifetime Generation: 149236.0 GW(e).h  
 Date of First Criticality: 12 Dec 1984      Cumulative Energy Availability Factor: 68.3%  
 Date of Grid Connection: 13 Feb 1985      Cumulative Load Factor: 67.5%  
 Date of Commercial Operation: 18 Sep 1985      Cumulative Unit Capability Factor: 69.6%  
    Cumulative Energy Unavailability Factor: 31.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	2939.8	1067.0	100.0	100.0	100.0	100.0	94.1	94.1	2808	95.9
1986	6703.7	1067.0	73.0	79.8	73.0	79.8	71.7	77.3	6463	73.8
1987	9195.5	1067.0	100.0	88.4	100.0	88.4	98.4	86.3	8760	100.0
1988	6959.7	1067.0	75.0	84.4	75.0	84.4	74.3	82.7	6660	75.8
1989	6442.3	1067.0	69.7	81.0	69.7	81.0	68.9	79.5	6236	71.2
1990	5987.4	1067.0	65.0	78.0	65.0	78.0	64.1	76.6	5711	65.2
1991	9031.6	1067.0	97.9	81.1	97.9	81.1	96.6	79.8	8618	98.4
1992	6958.1	1067.0	75.8	80.4	75.4	80.4	74.2	79.0	6728	76.6
1993	6874.3	1067.0	74.7	79.7	74.7	79.7	73.5	78.4	6575	75.1
1994	7020.2	1067.0	76.1	79.3	76.1	79.3	75.1	78.0	6744	77.0
1995	9235.2	1067.0	100.0	81.3	100.0	81.3	98.8	80.0	8760	100.0
1996	6814.4	1067.0	73.6	80.7	73.6	80.6	72.7	79.4	6469	73.6
1997	7899.9	1067.0	85.7	81.1	85.7	81.0	84.5	79.8	7525	85.9
1998	6176.2	1067.0	67.4	80.0	67.4	80.0	66.1	78.8	5960	68.0
1999	9198.8	1067.0	99.7	81.4	99.7	81.4	98.4	80.1	8760	100.0
2000	7714.7	1067.0	83.6	81.6	83.6	81.5	82.3	80.3	7346	83.6
2001	7070.5	1067.0	76.9	81.3	76.9	81.2	75.6	80.0	6743	77.0
2002	5906.2	1067.0	64.2	80.3	64.2	80.3	63.2	79.0	5628	64.2
2003	0.0	1067.0	0.0	75.9	0.0	75.9	0.0	74.7	0	0.0
2004	6496.7	1067.0	69.2	75.6	69.2	75.5	69.3	74.4	6171	70.3
2005	3125.9	1067.0	33.5	73.5	33.5	73.5	33.4	72.4	3051	34.8
2006	6299.4	1067.0	67.1	73.2	67.1	73.2	67.4	72.2	5899	67.3
2007	3165.8	1067.0	62.1	72.7	33.6	71.4	33.9	70.5	2952	33.7
2008	0.0	1067.0	-0.3	69.6	-0.3	68.3	0.0	67.5	0	0.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					391	
C. Inspection, maintenance or repair combined with refuelling				1787		
D. Inspection, maintenance or repair without refuelling	8784			37		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						108
Z. Others					79	
Subtotal	8784	0	0	1824	470	108
Total	8784			2402		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		53
15. Reactor Cooling System		245
21. Fuel Handling and Storage Facilities		41
32. Feedwater and Main Steam System		41
41. Main Generator System		9
Total	0	389

## JP-39 KASHIWAZAKI KARIWA-2

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 39500 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: -0.3%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.3%  
 Total Off-line Time: 8760 hours

### 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
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. 2008 Summary of Operation

PLANT INSPECTION AFTER EARTHQUAKE IN JULY 2007.

### 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: 69.1%  
 Date of Grid Connection: 08 Feb 1990      Cumulative Load Factor: 68.3%  
 Date of Commercial Operation: 28 Sep 1990      Cumulative Unit Capability Factor: 69.2%  
    Cumulative Energy Unavailability Factor: 30.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1990	2935.8	1067.0	100.0	100.0	100.0	100.0	94.0	94.0	2813	96.1
1991	6642.4	1067.0	72.4	79.3	72.4	79.3	71.1	76.8	6440	73.5
1992	9046.9	1067.0	97.9	87.3	97.9	87.3	96.5	85.3	8623	98.2
1993	7212.6	1067.0	78.5	84.7	78.3	84.6	77.2	82.8	6911	78.9
1994	7291.1	1067.0	79.0	83.4	79.0	83.3	78.0	81.7	6962	79.5
1995	7696.8	1067.0	83.4	83.4	83.4	83.3	82.3	81.8	7329	83.7
1996	8811.1	1067.0	95.3	85.3	95.2	85.2	94.0	83.8	8396	95.6
1997	7284.4	1067.0	79.1	84.4	79.1	84.4	77.9	83.0	6913	78.9
1998	8142.1	1067.0	88.4	84.9	88.4	84.9	87.1	83.5	7769	88.7
1999	8208.8	1067.0	89.2	85.4	89.1	85.3	87.8	83.9	7814	89.2
2000	8140.0	1067.0	88.3	85.6	88.3	85.6	86.8	84.2	7760	88.3
2001	7595.5	1067.0	82.4	85.4	82.4	85.3	81.3	84.0	7223	82.5
2002	5866.2	1067.0	63.1	83.6	63.1	83.5	62.8	82.2	5532	63.2
2003	0.0	1067.0	0.0	77.3	0.0	77.3	0.0	76.1	0	0.0
2004	4660.3	1067.0	49.6	75.4	49.6	75.3	49.7	74.2	4361	49.6
2005	6388.4	1067.0	68.4	74.9	68.4	74.9	68.3	73.8	6035	68.9
2006	9330.8	1067.0	99.8	76.4	99.8	76.4	99.8	75.4	8760	100.0
2007	1830.3	1067.0	19.8	73.2	19.8	73.1	19.6	72.2	1786	20.4
2008	0.0	1067.0	-0.3	69.2	-0.3	69.1	0.0	68.3	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1991 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					605	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling				1560		
D. Inspection, maintenance or repair without refuelling	8784			13		
Z. Others					69	
Subtotal	8784	0	0	1573	684	0
Total	8784			2257		

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

System	2008 Hours Lost	1991 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary System:		12
15. Reactor Cooling System:		321
31. Turbine and auxiliaries		268
Total	0	604

# JP-52 KASHIWAZAKI KARIWA-3

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 39500 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: -0.3%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.3%  
 Total Off-line Time: 8760 hours

## 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
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. 2008 Summary of Operation

PLANT INSPECTION AFTER EARTHQUAKE IN JULY 2007.

## 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: 68.3%  
 Date of Grid Connection: 08 Dec 1992      Cumulative Load Factor: 67.7%  
 Date of Commercial Operation: 11 Aug 1993      Cumulative Unit Capability Factor: 69.4%  
    Cumulative Energy Unavailability Factor: 31.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1993	3875.8	1067.0	100.0	100.0	100.0	100.0	98.9	98.9	3672	100.0
1994	7264.4	1067.0	78.9	85.1	78.9	85.1	77.7	84.0	6961	79.5
1995	9253.9	1067.0	100.0	91.3	100.0	91.3	99.0	90.2	8760	100.0
1996	7921.6	1067.0	85.5	89.6	85.5	89.6	84.5	88.5	7508	85.5
1997	8016.2	1067.0	86.8	88.9	86.8	88.9	85.8	87.9	7601	86.8
1998	6748.0	1067.0	73.1	86.0	73.1	86.0	72.2	85.0	6467	73.8
1999	9028.3	1067.0	97.7	87.8	97.7	87.8	96.6	86.8	8568	97.8
2000	7945.1	1067.0	85.8	87.6	85.8	87.6	84.8	86.5	7539	85.8
2001	6985.7	1067.0	75.8	86.2	75.8	86.2	74.7	85.1	6639	75.8
2002	5575.5	1067.0	60.4	83.4	60.4	83.4	59.7	82.4	5300	60.5
2003	0.0	1067.0	0.0	75.4	0.0	75.4	0.0	74.5	0	0.0
2004	6550.0	1067.0	69.9	74.9	69.9	74.9	69.9	74.1	6093	69.4
2005	6061.7	1067.0	64.9	74.1	64.9	74.1	64.9	73.4	5772	65.9
2006	7331.4	1067.0	78.3	74.5	78.3	74.4	78.4	73.7	6924	79.0
2007	5054.1	1067.0	71.4	74.2	53.7	73.0	54.1	72.4	4714	53.8
2008	0.0	1067.0	-0.3	69.4	-0.3	68.3	0.0	67.7	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1994 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					558	
C. Inspection, maintenance or repair combined with refuelling				1516		
D. Inspection, maintenance or repair without refuelling	8784					103
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					92	
Z. Others						
Subtotal	8784	0	0	1516	650	103
Total	8784			2269		

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

System	2008 Hours Lost	1994 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		521
15. Reactor Cooling System:		36
Total	0	557

# JP-53 KASHIWAZAKI KARIWA-4

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: HITACHI (HITACHI LTD.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 39500 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: -0.3%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.3%  
 Total Off-line Time: 8760 hours

## 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
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. 2008 Summary of Operation

PLANT INSPECTION AFTER EARTHQUAKE IN JULY 2007.

## 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: 67.0%  
 Date of Grid Connection: 21 Dec 1993      Cumulative Load Factor: 66.5%  
 Date of Commercial Operation: 11 Aug 1994      Cumulative Unit Capability Factor: 70.3%  
    Cumulative Energy Unavailability Factor: 33.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1994	3869.5	1067.0	99.8	99.8	99.8	99.8	98.8	98.8	3672	100.0
1995	6182.5	1067.0	67.0	76.7	67.0	76.7	66.1	75.8	5889	67.2
1996	8068.0	1067.0	87.1	81.0	87.1	81.0	86.1	80.0	7651	87.1
1997	7516.7	1067.0	81.7	81.2	81.5	81.1	80.4	80.2	7207	82.3
1998	9258.7	1067.0	100.0	85.4	100.0	85.4	99.1	84.4	8760	100.0
1999	8141.7	1067.0	88.1	85.9	88.1	85.9	87.1	84.9	7719	88.1
2000	6918.9	1067.0	75.1	84.2	75.1	84.2	73.8	83.2	6602	75.2
2001	5591.4	1067.0	60.6	81.1	60.6	81.0	59.8	80.0	5343	61.0
2002	9239.9	1067.0	100.0	83.3	99.9	83.3	98.9	82.3	8760	100.0
2003	4185.8	1067.0	45.0	79.2	45.0	79.2	44.8	78.3	3946	45.0
2004	5623.7	1067.0	59.9	77.4	59.9	77.3	60.0	76.5	5258	59.9
2005	7192.0	1067.0	76.8	77.3	76.8	77.3	76.9	76.6	6755	77.1
2006	2816.5	1067.0	31.0	73.6	30.4	73.5	30.1	72.8	2772	31.6
2007	5061.7	1067.0	100.0	75.6	53.8	72.1	54.2	71.4	4714	53.8
2008	0.0	1067.0	-0.3	70.3	-0.3	67.0	0.0	66.5	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1995 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					435	
C. Inspection, maintenance or repair combined with refuelling				1544	20	
D. Inspection, maintenance or repair without refuelling	8784					
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					45	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						288
Subtotal	8784	0	0	1544	500	288
Total	8784			2332		

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

System	2008 Hours Lost	1995 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		41
15. Reactor Cooling Systems		163
31. Turbine and auxiliaries		36
41. Main Generator Systems		133
42. Electrical Power Supply Systems		61
Total	0	434

# JP-40 KASHIWAZAKI KARIWA-5

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: HITACHI (HITACHI LTD.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1067.0 MW(e)  
 Design Net Capacity: 1067.0 MW(e)  
 Design Discharge Burnup: 39500 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: -0.3%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.3%  
 Total Off-line Time: 8760 hours

## 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
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. 2008 Summary of Operation

PLANT INSPECTION AFTER EARTHQUAKE IN JULY 2007.

## 5. Historical Summary

Date of Construction Start: 20 Jun 1985      Lifetime Generation: 126197.0 GW(e).h  
 Date of First Criticality: 20 Jul 1989      Cumulative Energy Availability Factor: 71.5%  
 Date of Grid Connection: 12 Sep 1989      Cumulative Load Factor: 70.8%  
 Date of Commercial Operation: 10 Apr 1990      Cumulative Unit Capability Factor: 74.2%  
    Cumulative Energy Unavailability Factor: 28.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1990	6953.3	1067.0	100.0	100.0	100.0	100.0	98.7	98.7	6600	100.0
1991	7093.3	1067.0	76.7	86.7	76.7	86.7	75.9	85.7	6789	77.5
1992	6977.5	1067.0	75.5	82.6	75.5	82.6	74.4	81.6	6715	76.4
1993	9238.2	1067.0	99.9	87.2	99.9	87.2	98.8	86.2	8760	100.0
1994	7154.7	1067.0	77.5	85.2	77.5	85.2	76.5	84.2	6825	77.9
1995	7508.3	1067.0	81.5	84.5	81.5	84.5	80.3	83.5	7183	82.0
1996	7905.8	1067.0	85.6	84.7	85.6	84.7	84.4	83.6	7524	85.7
1997	8919.1	1067.0	96.6	86.2	96.6	86.2	95.4	85.1	8472	96.7
1998	7352.6	1067.0	79.6	85.5	79.6	85.5	78.7	84.4	6995	79.9
1999	7771.8	1067.0	84.3	85.4	84.3	85.4	83.1	84.3	7383	84.3
2000	7042.7	1067.0	76.4	84.5	76.3	84.5	75.1	83.4	6712	76.4
2001	9198.6	1067.0	99.6	85.8	99.6	85.8	98.4	84.7	8760	100.0
2002	8191.0	1067.0	88.3	86.0	88.3	86.0	87.6	84.9	7743	88.4
2003	1503.1	1067.0	16.1	80.9	16.1	80.9	16.1	79.9	1392	15.9
2004	6134.8	1067.0	65.3	79.9	65.3	79.8	65.5	78.9	5738	65.3
2005	6852.9	1067.0	73.0	79.4	73.0	79.4	73.3	78.6	6446	73.6
2006	8400.5	1067.0	89.5	80.0	89.5	80.0	89.9	79.3	7848	89.6
2007	0.0	1067.0	51.0	78.4	0.0	75.5	0.0	74.8	0	0.0
2008	0.0	1067.0	-0.3	74.2	-0.3	71.5	0.0	70.8	0	0.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1991 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					284	
C. Inspection, maintenance or repair combined with refuelling				1508		
D. Inspection, maintenance or repair without refuelling	8784			13		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						248
Z. Others					54	
Subtotal	8784	0	0	1521	338	248
Total	8784			2107		

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

System	2008 Hours Lost	1991 to 2008 Average Hours Lost Per Year
15. Reactor Cooling System:		277
31. Turbine and auxiliaries		7
Total	0	284

# JP-55 KASHIWAZAKI KARIWA-6

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

## 1. Station Details

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 1315.0 MW(e)

Design Net Capacity: 1315.0 MW(e)

Design Discharge Burnup: 39500 MW.d/t

Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 0.0 GW(e).h

Energy Availability Factor: -0.3%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.3%

Total Off-line Time: 8760 hours

## 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
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. 2008 Summary of Operation

PLANT INSPECTION AFTER EARTHQUAKE IN JULY 2007.

## 5. Historical Summary

Date of Construction Start: 03 Nov 1992      Lifetime Generation: 106689.0 GW(e).h

Date of First Criticality: 18 Dec 1995      Cumulative Energy Availability Factor: 72.9%

Date of Grid Connection: 29 Jan 1996      Cumulative Load Factor: 73.5%

Date of Commercial Operation: 07 Nov 1996      Cumulative Unit Capability Factor: 76.3%

   Cumulative Energy Unavailability Factor: 27.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1996	1920.8	1315.0	100.0	100.0	100.0	100.0	99.8	99.8	1464	100.0
1997	10161.5	1315.0	88.4	90.1	88.4	90.1	88.2	89.9	7752	88.5
1998	10702.3	1315.0	93.3	91.6	93.3	91.6	92.9	91.3	8217	93.8
1999	9710.4	1315.0	84.8	89.4	84.8	89.4	84.3	89.1	7480	85.4
2000	9411.6	1315.0	81.8	87.6	81.8	87.6	81.5	87.2	7183	81.8
2001	9270.0	1315.0	80.7	86.3	80.7	86.3	80.5	85.9	7079	80.8
2002	11504.1	1315.0	100.0	88.5	100.0	88.5	99.9	88.2	8760	100.0
2003	8401.2	1315.0	71.5	86.1	71.5	86.1	72.9	86.1	6163	70.4
2004	8635.2	1315.0	72.7	84.5	72.7	84.5	74.8	84.7	6410	73.0
2005	11126.5	1315.0	93.9	85.5	93.9	85.5	96.6	86.0	8232	94.0
2006	8446.7	1315.0	71.4	84.1	71.4	84.1	73.3	84.7	6301	71.9
2007	3758.2	1315.0	73.0	83.1	31.6	79.4	32.6	80.1	2787	31.8
2008	0.0	1315.0	-0.3	76.3	-0.3	72.9	0.0	73.5	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1997 to 2008 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				1118		
D. Inspection, maintenance or repair without refuelling	8784					302
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					135	
Z. Others						
Subtotal	8784	0	0	1118	249	302
Total	8784			1669		

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

System	2008 Hours Lost	1997 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		7
21. Fuel Handling and Storage Facilities		28
32. Feedwater and Main Steam System		53
41. Main Generator System:		17
42. Electrical Power Supply System:		8
Total	0	113

# JP-56 KASHIWAZAKI KARIWA-7

Operator: TEPCO (TOKYO ELECTRIC POWER CO.,INC.)

Contractor: HITACHI (HITACHI LTD.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1315.0 MW(e)  
 Design Net Capacity: 1315.0 MW(e)  
 Design Discharge Burnup: 39500 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: -0.3%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.3%  
 Total Off-line Time: 8760 hours

## 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
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. 2008 Summary of Operation

PLANT INSPECTION AFTER EARTHQUAKE IN JULY 2007.

## 5. Historical Summary

Date of Construction Start: 01 Jul 1993      Lifetime Generation: 94682.0 GW(e).h  
 Date of First Criticality: 01 Nov 1996      Cumulative Energy Availability Factor: 69.1%  
 Date of Grid Connection: 17 Dec 1996      Cumulative Load Factor: 69.7%  
 Date of Commercial Operation: 02 Jul 1997      Cumulative Unit Capability Factor: 72.3%  
    Cumulative Energy Unavailability Factor: 30.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1997	5792.8	1315.0	100.0	100.0	100.0	100.0	99.8	99.8	4416	100.0
1998	9715.6	1315.0	84.7	89.8	84.7	89.8	84.3	89.5	7452	85.1
1999	8445.4	1315.0	73.7	83.4	73.7	83.4	73.3	83.0	6458	73.7
2000	11240.2	1315.0	97.6	87.4	97.6	87.4	97.3	87.1	8587	97.8
2001	10078.4	1315.0	87.8	87.5	87.8	87.5	87.5	87.2	7752	88.5
2002	7990.0	1315.0	69.5	84.2	68.9	84.1	69.4	84.0	6089	69.5
2003	5778.5	1315.0	49.2	78.9	49.2	78.8	50.2	78.8	4302	49.1
2004	10805.2	1315.0	94.5	80.9	91.6	80.5	93.5	80.7	8057	91.7
2005	7977.5	1315.0	68.0	79.4	68.0	79.0	69.3	79.4	6007	68.6
2006	8166.2	1315.0	69.9	78.4	69.5	78.0	70.9	78.5	6250	71.3
2007	6358.6	1315.0	87.1	79.2	53.8	75.7	55.2	76.3	4714	53.8
2008	0.0	1315.0	-0.3	72.3	-0.3	69.1	0.0	69.7	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1998 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					283	
C. Inspection, maintenance or repair combined with refuelling				1218		
D. Inspection, maintenance or repair without refuelling	8784			87		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				102		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						288
Z. Others					34	
Subtotal	8784	0	0	1407	317	288
Total	8784			2012		

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

System	2008 Hours Lost	1998 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		98
12. Reactor I&C Systems		85
15. Reactor Cooling Systems		100
Total	0	283

## JP-4 MIHAMA-1

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2119.5 GW(e).h  
**Energy Availability Factor:** 74.7%  
**Load Factor:** 75.6%  
**Operating Factor:** 74.9%  
**Energy Unavailability Factor:** 25.3%  
**Total Off-line Time:** 2199 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	245.6	229.8	192.2	0.0	0.0	42.0	240.5	237.1	231.4	242.2	212.9	245.7	2119.5
<b>EAF (%)</b>	99.9	99.9	78.3	-0.1	0.0	18.2	99.9	99.9	99.9	99.9	99.9	99.9	74.7
<b>UCF (%)</b>	99.9	99.9	78.3	-0.1	0.0	18.2	99.9	99.9	99.9	99.9	99.9	99.9	74.7
<b>LF (%)</b>	103.2	106.9	80.7	0.0	0.0	18.2	101.0	99.6	100.4	101.6	92.4	103.2	75.6
<b>OF (%)</b>	100.0	103.6	78.9	0.0	0.0	23.8	100.0	100.0	100.0	99.9	92.6	100.0	74.9
<b>EUF (%)</b>	0.1	0.1	21.7	100.1	100.0	81.8	0.1	0.1	0.1	0.1	0.1	0.1	25.3
<b>PUF (%)</b>	0.1	0.1	21.7	100.1	100.0	81.8	0.1	0.1	0.1	0.1	0.1	0.1	25.3
<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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING(2008/3/25-2008/6/27)

## 5. Historical Summary

**Date of Construction Start:** 01 Feb 1967  
**Date of First Criticality:** 29 Jul 1970  
**Date of Grid Connection:** 08 Aug 1970  
**Date of Commercial Operation:** 28 Nov 1970

**Lifetime Generation:** 55524.0 GW(e).h  
**Cumulative Energy Availability Factor:** 51.2%  
**Cumulative Load Factor:** 52.0%  
**Cumulative Unit Capability Factor:** 51.4%  
**Cumulative Energy Unavailability Factor:** 48.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1970	337.0	320.0	100.0	100.0	100.0	100.0	71.9	71.9	1017	69.5
1971	1953.8	320.0	100.0	100.0	100.0	100.0	69.7	70.0	5977	68.2
1972	1260.0	320.0	47.8	75.9	47.4	75.7	44.8	58.4	4156	47.3
1973	945.3	320.0	47.9	67.1	47.9	66.9	33.7	50.6	4865	55.5
1974	391.8	320.0	20.9	56.0	20.9	55.9	14.0	41.8	2151	24.6
1975	0.0	320.0	0.0	45.2	0.0	45.1	0.0	33.7	0	0.0
1976	0.0	320.0	0.0	37.8	0.0	37.8	0.0	28.2	0	0.0
1977	0.0	320.0	0.0	32.6	0.0	32.5	0.0	24.3	0	0.0
1978	118.7	320.0	4.2	29.1	4.2	29.0	4.2	21.9	1059	12.1
1979	115.4	320.0	4.1	26.4	4.1	26.3	4.1	19.9	1014	11.6
1980	1012.9	320.0	36.0	27.3	36.0	27.3	36.0	21.5	4472	50.9
1981	1178.1	320.0	42.0	28.6	42.0	28.6	42.0	23.3	3931	44.9
1982	92.8	320.0	3.3	26.6	3.3	26.5	3.3	21.7	455	5.2
1983	1164.4	320.0	41.5	27.7	41.5	27.7	41.5	23.2	3731	42.6
1984	1576.6	320.0	56.0	29.7	56.0	29.7	56.1	25.5	5053	57.5
1985	2240.2	320.0	80.0	33.0	80.0	33.0	79.9	29.1	7077	80.8
1986	2707.2	320.0	96.6	36.9	96.3	36.9	96.6	33.3	8482	96.8
1987	2261.5	320.0	81.6	39.5	81.6	39.5	80.7	36.0	7150	81.6
1988	2075.4	320.0	75.4	41.5	75.4	41.5	73.8	38.1	6623	75.4
1989	1693.2	320.0	61.8	42.6	61.8	42.5	60.4	39.3	5418	61.8
1990	1938.2	320.0	66.9	43.8	66.9	43.7	69.1	40.8	6058	69.2
1991	2371.9	320.0	8.8	42.1	4.5	41.9	84.6	42.8	7615	86.9
1992	1041.1	320.0	37.2	41.9	37.2	41.7	37.0	42.6	3511	40.0
1993	1663.3	320.0	58.5	42.6	58.5	42.4	59.3	43.3	5300	60.5
1994	369.9	320.0	13.4	41.4	13.4	41.2	13.2	42.1	1160	13.2
1995	0.0	320.0	0.0	39.8	0.0	39.6	0.0	40.4	0	0.0
1996	2245.9	320.0	79.7	41.3	79.7	41.1	79.9	41.9	7186	81.8
1997	2271.5	320.0	80.8	42.7	80.8	42.6	81.0	43.3	7083	80.9
1998	2321.5	320.0	82.5	44.2	82.5	44.0	82.8	44.7	7304	83.4
1999	2530.4	320.0	90.0	45.7	90.0	45.6	90.3	46.3	8013	91.5
2000	2381.2	320.0	84.6	47.0	84.5	46.9	84.7	47.6	7439	84.7
2001	2104.4	320.0	75.0	47.9	74.9	47.8	75.1	48.5	6574	75.0
2002	2158.6	320.0	77.1	48.8	76.6	48.7	77.0	49.3	6767	77.2
2003	2880.6	320.0	99.9	50.4	99.9	50.2	102.8	51.0	8760	100.0
2004	1764.2	320.0	61.3	50.7	61.3	50.5	62.8	51.3	5389	61.4
2005	1194.9	320.0	41.4	50.4	41.4	50.3	42.6	51.1	4022	45.9
2006	2353.3	320.0	83.3	51.3	83.3	51.2	84.0	52.0	7305	83.4
2007	854.7	320.0	30.3	50.8	30.3	50.6	30.5	51.4	2723	31.1
2008	2119.5	320.0	74.7	51.4	74.7	51.2	75.6	52.0	6561	74.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					1804	
C. Inspection, maintenance or repair combined with refuelling	2170			1762		
D. Inspection, maintenance or repair without refuelling				289		
E. Testing of plant systems or component:				0	3	
J. Grid limitation, failure or grid unavailability			53			1
Z. Others					113	
Subtotal	2170	0	53	2051	1920	1
Total	2223			3972		

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		11
14. Safety Systems		88
15. Reactor Cooling System:		58
16. Steam generation system:		1475
31. Turbine and auxiliaries		115
32. Feedwater and Main Steam System		42
42. Electrical Power Supply System:		0
Total	0	1795



## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 1713.1 GW(e).h  
**Energy Availability Factor:** 41.5%  
**Load Factor:** 41.6%  
**Operating Factor:** 42.0%  
**Energy Unavailability Factor:** 58.5%  
**Total Off-line Time:** 5082 hours

### 3. 2008 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	2.8	334.9	337.5	353.7	325.3	358.9	1713.1
<b>EAF (%)</b>	0.0	-3.6	0.0	-0.1	0.0	0.0	0.9	97.3	99.9	99.9	99.9	99.9	41.5
<b>UCF (%)</b>	0.0	-3.6	0.0	-0.1	0.0	0.0	0.9	97.3	99.9	99.9	99.9	99.9	41.5
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.8	95.8	99.7	101.0	96.1	102.6	41.6
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	3.9	100.0	100.0	99.9	96.8	100.0	42.0
<b>EUF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	99.1	2.7	0.1	0.1	0.1	0.1	58.5
<b>PUF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	93.3	2.7	0.1	0.1	0.1	0.1	58.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	5.8	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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2007/7/20-2008/8/3)

## 5. Historical Summary

**Date of Construction Start:** 29 May 1968  
**Date of First Criticality:** 10 Apr 1972  
**Date of Grid Connection:** 21 Apr 1972  
**Date of Commercial Operation:** 25 Jul 1972

**Lifetime Generation:** 92219.0 GW(e).h  
**Cumulative Energy Availability Factor:** 61.4%  
**Cumulative Load Factor:** 61.4%  
**Cumulative Unit Capability Factor:** 61.4%  
**Cumulative Energy Unavailability Factor:** 38.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	1318.0	492.0	67.5	67.5	67.5	67.5	59.7	59.7	3212	72.7
1973	2509.3	470.0	63.3	64.8	63.3	64.8	60.9	60.5	5569	63.6
1974	3122.8	470.0	77.0	69.6	77.0	69.6	75.8	66.6	6766	77.2
1975	260.3	470.0	6.4	51.7	6.4	51.7	6.3	49.5	818	9.3
1976	2828.2	470.0	68.7	55.5	68.7	55.5	68.5	53.7	7011	79.8
1977	1648.0	470.0	40.0	52.7	40.0	52.7	40.0	51.2	3679	42.0
1978	2648.7	470.0	64.5	54.5	64.5	54.5	64.3	53.2	5852	66.8
1979	867.1	470.0	21.1	50.1	21.1	50.1	21.1	49.0	1944	22.2
1980	3032.7	470.0	73.3	52.8	73.3	52.8	73.5	51.9	6622	75.4
1981	2762.9	470.0	66.9	54.3	66.9	54.3	67.1	53.4	5982	68.3
1982	2238.9	470.0	54.2	54.3	54.2	54.3	54.4	53.5	4958	56.6
1983	1433.8	470.0	34.7	52.6	34.7	52.6	34.8	51.9	3262	37.2
1984	3937.3	470.0	96.3	56.1	96.3	56.1	95.4	55.4	8458	96.3
1985	2898.3	470.0	70.2	57.1	70.2	57.1	70.4	56.5	6219	71.0
1986	3301.5	470.0	80.2	58.7	80.0	58.7	80.2	58.1	7100	81.1
1987	2766.2	470.0	67.7	59.3	67.7	59.3	67.2	58.7	5927	67.7
1988	3223.1	470.0	77.8	60.4	77.8	60.4	78.1	59.9	6850	78.0
1989	3325.2	470.0	81.2	61.6	81.2	61.6	80.8	61.1	7112	81.2
1990	3077.1	470.0	72.7	62.2	72.7	62.2	74.7	61.8	6594	75.3
1991	447.1	470.0	10.0	59.5	10.0	59.5	10.9	59.2	950	10.8
1992	0.0	470.0	0.0	56.6	0.0	56.6	0.0	56.3	0	0.0
1993	0.0	470.0	0.0	54.0	0.0	54.0	0.0	53.7	0	0.0
1994	1186.3	470.0	29.9	52.9	29.9	52.9	28.8	52.6	2522	28.8
1995	3335.0	470.0	80.7	54.1	80.5	54.1	81.0	53.8	7138	81.5
1996	3762.4	470.0	90.6	55.6	90.5	55.6	91.1	55.3	8024	91.3
1997	3006.0	470.0	72.6	56.2	72.6	56.2	73.0	56.0	6417	73.3
1998	3396.3	470.0	82.0	57.2	82.0	57.2	82.5	57.0	7228	82.5
1999	2746.4	470.0	66.3	57.5	66.3	57.5	66.7	57.4	5821	66.4
2000	3839.7	470.0	92.5	58.8	92.5	58.8	93.0	58.6	8137	92.6
2001	2911.3	470.0	70.4	59.2	70.3	59.1	70.7	59.0	6177	70.5
2002	3611.3	470.0	87.2	60.1	87.2	60.1	87.7	60.0	7648	87.3
2003	3400.2	470.0	81.5	60.8	81.5	60.7	82.6	60.7	7182	82.0
2004	2942.3	470.0	70.2	61.1	70.2	61.0	71.3	61.0	6170	70.2
2005	3525.4	470.0	84.8	61.8	84.8	61.7	85.6	61.7	7470	85.3
2006	3110.9	470.0	75.0	62.1	75.0	62.1	75.6	62.1	6671	76.2
2007	2294.2	470.0	54.8	61.9	54.8	61.9	55.7	62.0	4811	54.9
2008	1713.1	470.0	41.5	61.4	41.5	61.4	41.6	61.4	3678	42.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		43			476	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	5040			2432	40	
D. Inspection, maintenance or repair without refuelling				84		
J. Grid limitation, failure or grid unavailability			23			
Z. Others					70	
Subtotal	5040	43	23	2516	586	0
Total	5106			3102		

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:	43	48
15. Reactor Cooling System:		3
16. Steam generation system:		371
31. Turbine and auxiliaries:		24
32. Feedwater and Main Steam System		0
41. Main Generator System:		3
42. Electrical Power Supply System:		25
Total	43	474

## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 5725.5 GW(e).h  
**Energy Availability Factor:** 79.7%  
**Load Factor:** 83.8%  
**Operating Factor:** 80.5%  
**Energy Unavailability Factor:** 20.3%  
**Total Off-line Time:** 1711 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	612.0	573.1	613.4	594.0	613.0	590.3	602.1	596.2	5.3	0.0	316.4	609.7	5725.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.9	0.1	55.1	100.0	79.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	1.0	0.1	55.1	100.0	79.7
<b>LF (%)</b>	105.5	109.3	105.7	105.9	105.6	105.1	103.8	102.7	0.9	0.0	56.3	105.1	83.8
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	1.5	0.0	60.8	100.0	80.5
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	99.1	99.9	44.9	0.0	20.3
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	99.1	99.9	44.9	0.0	20.3
<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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2008/9/1-2008/11/16)

## 5. Historical Summary

<b>Date of Construction Start:</b>	07 Aug 1972	<b>Lifetime Generation:</b>	153876.0 GW(e).h
<b>Date of First Criticality:</b>	28 Jan 1976	<b>Cumulative Energy Availability Factor:</b>	69.6%
<b>Date of Grid Connection:</b>	19 Feb 1976	<b>Cumulative Load Factor:</b>	70.1%
<b>Date of Commercial Operation:</b>	01 Dec 1976	<b>Cumulative Unit Capability Factor:</b>	69.7%
		<b>Cumulative Energy Unavailability Factor:</b>	30.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976	493.6	780.0	85.1	85.1	85.1	85.1	85.1	85.1	744	100.0
1977	4498.5	780.0	65.8	67.4	65.8	67.4	65.8	67.3	6159	70.3
1978	4166.6	780.0	59.5	63.6	59.5	63.6	61.0	64.3	5537	63.2
1979	1697.4	780.0	24.8	51.0	24.8	51.0	24.8	51.5	2307	26.3
1980	4597.7	780.0	67.0	55.0	67.0	55.0	67.1	55.3	5964	67.9
1981	5832.9	780.0	85.2	60.9	85.2	60.9	85.4	61.2	7607	86.8
1982	5239.1	780.0	76.4	63.4	76.4	63.4	76.7	63.8	6952	79.4
1983	4818.0	780.0	70.6	64.4	70.6	64.4	70.5	64.7	6330	72.3
1984	5353.7	780.0	77.8	66.1	77.8	66.1	78.1	66.4	6906	78.6
1985	4971.9	780.0	72.6	66.8	72.6	66.8	72.8	67.1	6426	73.4
1986	6848.4	780.0	99.8	70.1	99.8	70.1	100.2	70.4	8760	100.0
1987	4822.7	780.0	71.6	70.2	71.6	70.2	70.6	70.4	6268	71.6
1988	4261.3	780.0	64.0	69.7	64.0	69.7	62.2	69.7	5625	64.0
1989	5299.7	780.0	78.0	70.3	78.0	70.3	77.6	70.3	6834	78.0
1990	6867.0	780.0	100.0	72.4	100.0	72.4	100.5	72.5	8760	100.0
1991	4246.2	780.0	59.7	71.6	59.7	71.6	62.1	71.8	5495	62.7
1992	4709.9	780.0	68.5	71.4	68.5	71.4	68.7	71.6	6095	69.4
1993	4526.6	780.0	66.4	71.1	66.1	71.1	66.2	71.3	5951	67.9
1994	6623.0	780.0	96.8	72.5	96.8	72.5	96.9	72.7	8486	96.9
1995	3389.2	780.0	49.7	71.3	49.6	71.3	49.6	71.5	4534	51.8
1996	4491.4	780.0	65.5	71.1	65.3	71.0	65.6	71.2	5760	65.6
1997	6262.8	780.0	91.2	72.0	91.2	72.0	91.7	72.2	7963	90.9
1998	5979.9	780.0	87.1	72.7	87.1	72.7	87.5	72.8	7788	88.9
1999	5795.3	780.0	84.4	73.2	84.4	73.2	84.8	73.4	7398	84.5
2000	4785.0	780.0	69.6	73.1	69.6	73.0	69.8	73.2	6117	69.6
2001	6853.7	780.0	100.0	74.1	100.0	74.1	100.3	74.3	8760	100.0
2002	5248.0	780.0	76.8	74.2	76.8	74.2	76.8	74.4	6732	76.8
2003	6111.5	780.0	87.9	74.7	87.9	74.7	89.4	74.9	7701	87.9
2004	4301.3	780.0	60.5	74.2	60.5	74.2	62.8	74.5	5319	60.6
2005	0.0	780.0	0.0	71.7	0.0	71.7	0.0	72.0	0	0.0
2006	92.1	780.0	1.4	69.3	1.4	69.3	1.3	69.6	181	2.1
2007	4943.9	780.0	69.5	69.3	69.5	69.3	72.4	69.7	6190	70.7
2008	5725.5	780.0	79.7	69.7	79.7	69.6	83.8	70.1	7049	80.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					132	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	1735			2310		
E. Testing of plant systems or component				0	3	
Subtotal	1735	0	0	2310	143	0
Total	1735			2453		

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		33
15. Reactor Cooling System		11
16. Steam generation system		29
32. Feedwater and Main Steam System		54
Total	0	127

# JP-15 OHI-1

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 8316.9 GW(e).h  
**Energy Availability Factor:** 83.2%  
**Load Factor:** 84.8%  
**Operating Factor:** 83.8%  
**Energy Unavailability Factor:** 16.8%  
**Total Off-line Time:** 1416 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	848.5	796.9	851.0	822.5	849.5	88.6	0.0	741.3	811.6	842.9	817.9	846.2	8316.9
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	10.8	0.0	89.0	100.0	100.0	100.0	100.0	83.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	10.8	0.0	89.0	100.0	100.0	100.0	100.0	83.2
<b>LF (%)</b>	101.8	105.9	102.1	102.1	102.0	11.0	0.0	89.0	100.6	101.0	101.4	101.6	84.8
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	11.4	0.0	92.2	100.0	99.9	100.0	100.0	83.8
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	89.2	100.0	11.0	0.0	0.0	0.0	0.0	16.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	89.2	100.0	11.0	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	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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2008/6/4-2008/8/5)

## 5. Historical Summary

<b>Date of Construction Start:</b>	26 Oct 1972	<b>Lifetime Generation:</b>	196568.0 GW(e).h
<b>Date of First Criticality:</b>	02 Dec 1977	<b>Cumulative Energy Availability Factor:</b>	66.6%
<b>Date of Grid Connection:</b>	23 Dec 1977	<b>Cumulative Load Factor:</b>	67.2%
<b>Date of Commercial Operation:</b>	27 Mar 1979	<b>Cumulative Unit Capability Factor:</b>	66.6%
		<b>Cumulative Energy Unavailability Factor:</b>	33.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	3900.2	1120.0	47.3	47.3	47.3	47.3	47.4	47.4	3701	50.4
1980	3890.5	1120.0	39.3	42.9	39.3	42.9	39.5	43.1	3635	41.4
1981	3035.4	1120.0	30.9	38.7	30.9	38.7	30.9	38.8	2938	33.5
1982	6659.8	1120.0	67.5	46.2	67.5	46.2	67.9	46.4	6076	69.4
1983	8212.6	1120.0	83.0	53.8	83.0	53.8	83.7	54.1	7282	83.1
1984	7015.1	1120.0	70.8	56.7	70.8	56.7	71.3	57.1	6292	71.6
1985	5794.1	1120.0	59.0	57.0	58.7	57.0	59.1	57.3	5217	59.6
1986	5138.8	1120.0	52.2	56.4	52.2	56.4	52.4	56.7	4664	53.2
1987	9421.7	1120.0	95.3	60.8	95.3	60.8	96.0	61.2	8430	96.2
1988	3282.4	1120.0	34.8	58.2	34.8	58.1	33.4	58.3	3053	34.8
1989	2744.9	1120.0	29.5	55.5	29.5	55.5	28.0	55.5	2587	29.5
1990	5446.5	1120.0	52.9	55.3	52.9	55.3	55.5	55.5	4919	56.2
1991	5706.3	1120.0	55.8	55.3	55.8	55.3	58.2	55.7	5160	58.9
1992	5488.2	1120.0	55.5	55.3	55.4	55.3	55.8	55.7	4957	56.4
1993	5010.3	1120.0	50.7	55.0	50.7	55.0	51.1	55.4	4535	51.8
1994	6929.9	1120.0	70.2	56.0	69.9	55.9	70.6	56.4	6202	70.8
1995	6537.9	1120.0	66.1	56.6	66.1	56.6	66.6	57.0	6010	68.6
1996	7026.3	1120.0	70.7	57.4	70.7	57.3	71.4	57.8	6305	71.8
1997	7998.8	1120.0	80.8	58.6	80.7	58.6	81.5	59.1	7080	80.8
1998	9406.5	1120.0	95.0	60.5	95.0	60.4	95.9	60.9	8359	95.4
1999	6933.7	1120.0	70.0	60.9	70.0	60.9	70.7	61.4	6136	70.0
2000	6323.6	1120.0	63.7	61.0	63.6	61.0	64.3	61.5	5668	64.5
2001	9333.1	1120.0	94.5	62.5	94.2	62.5	95.1	63.0	8273	94.4
2002	7935.8	1120.0	80.3	63.3	80.2	63.2	80.9	63.7	7038	80.3
2003	8118.7	1120.0	81.8	64.0	81.8	63.9	82.7	64.5	7142	81.5
2004	7777.0	1120.0	77.7	64.5	77.7	64.5	79.1	65.1	6825	77.7
2005	7272.5	1120.0	75.1	64.9	75.1	64.9	74.1	65.4	6510	74.3
2006	9628.3	1120.0	97.3	66.1	97.3	66.0	98.1	66.6	8530	97.4
2007	6522.9	1120.0	65.5	66.1	65.5	66.0	66.5	66.6	5796	66.2
2008	8316.9	1120.0	83.2	66.6	83.2	66.6	84.8	67.2	7344	83.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1979 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					324	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1441			2393		
E. Testing of plant systems or component:				47		
J. Grid limitation, failure or grid unavailability						5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						0
Z. Others					18	
Subtotal	1441	0	0	2440	344	5
Total		1441			2789	

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

System	2008 Hours Lost	1979 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		13
13. Reactor Auxiliary System:		2
14. Safety Systems		6
15. Reactor Cooling System:		33
16. Steam generation system:		219
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		12
42. Electrical Power Supply System:		2
Total	0	296



## JP-19 OHI-2

**Operator:** KEPCO (KANSAI ELECTRIC POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 10041.5 GW(e).h  
**Energy Availability Factor:** 99.1%  
**Load Factor:** 102.1%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.9%  
**Total Off-line Time:** 0 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	864.0	806.7	759.6	836.2	862.5	833.1	854.0	845.9	823.8	857.7	833.1	864.8	10041.5
<b>EAF (%)</b>	100.0	100.0	89.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1
<b>UCF (%)</b>	100.0	100.0	89.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1
<b>LF (%)</b>	103.7	103.5	91.2	103.7	103.5	103.3	102.5	101.5	102.2	102.9	103.3	103.8	102.1
<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	10.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
<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	10.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	08 Dec 1972	<b>Lifetime Generation:</b>	210566.0 GW(e).h
<b>Date of First Criticality:</b>	14 Sep 1978	<b>Cumulative Energy Availability Factor:</b>	73.0%
<b>Date of Grid Connection:</b>	11 Oct 1978	<b>Cumulative Load Factor:</b>	73.7%
<b>Date of Commercial Operation:</b>	05 Dec 1979	<b>Cumulative Unit Capability Factor:</b>	73.2%
		<b>Cumulative Energy Unavailability Factor:</b>	27.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	839.3	1120.0	100.0	100.0	100.0	100.0	100.7	100.7	744	100.0
1980	5466.4	1120.0	55.2	58.7	55.2	58.7	55.6	59.1	4976	56.6
1981	5031.7	1120.0	51.0	55.0	51.0	55.0	51.3	55.4	4668	53.3
1982	8648.6	1120.0	87.6	65.6	87.6	65.6	88.2	66.0	7877	89.9
1983	7443.8	1120.0	75.2	67.9	75.2	67.9	75.9	68.4	6670	76.1
1984	5793.5	1120.0	58.5	66.1	58.5	66.1	58.9	66.5	5208	59.3
1985	6843.0	1120.0	69.2	66.6	69.2	66.6	69.7	67.1	6260	71.5
1986	9858.9	1120.0	99.5	71.2	99.5	71.2	100.5	71.8	8760	100.0
1987	6238.1	1120.0	66.8	70.7	65.3	70.5	63.6	70.8	5789	66.1
1988	6112.3	1120.0	62.9	69.8	62.9	69.7	62.1	69.8	5525	62.9
1989	9828.0	1120.0	99.4	72.8	99.4	72.6	100.2	72.8	8707	99.4
1990	6685.7	1120.0	66.1	72.2	66.1	72.0	68.1	72.4	6069	69.3
1991	6409.5	1120.0	71.3	72.1	69.4	71.8	65.3	71.8	5903	67.4
1992	6973.3	1120.0	70.2	71.9	70.2	71.7	70.9	71.7	6178	70.3
1993	8863.9	1120.0	89.5	73.2	89.5	72.9	90.3	73.1	7903	90.2
1994	6680.0	1120.0	67.9	72.8	67.9	72.6	68.1	72.7	5929	67.7
1995	3273.5	1120.0	33.4	70.4	33.3	70.2	33.4	70.3	3060	34.9
1996	9738.2	1120.0	98.3	72.0	98.0	71.8	99.0	72.0	8662	98.6
1997	5316.5	1120.0	53.7	71.0	53.7	70.8	54.2	71.0	4753	54.3
1998	6501.3	1120.0	65.7	70.7	65.6	70.5	66.3	70.7	5760	65.8
1999	4511.1	1120.0	45.6	69.5	45.6	69.3	46.0	69.5	3994	45.6
2000	7796.8	1120.0	78.6	69.9	78.6	69.7	79.3	70.0	6987	79.5
2001	7163.5	1120.0	71.3	70.0	71.3	69.8	73.0	70.1	6302	71.9
2002	8265.6	1120.0	83.6	70.6	83.6	70.4	84.2	70.7	7326	83.6
2003	10075.6	1120.0	100.0	71.8	100.0	71.6	102.7	72.0	8760	100.0
2004	8408.3	1120.0	83.4	72.3	83.4	72.1	85.5	72.6	7324	83.4
2005	6970.4	1120.0	70.6	72.2	70.6	72.0	71.0	72.5	6139	70.1
2006	7003.7	1120.0	69.1	72.1	69.1	71.9	71.4	72.5	6085	69.5
2007	7759.9	1120.0	76.8	72.2	76.8	72.1	79.1	72.7	6768	77.3
2008	10041.5	1120.0	99.1	73.2	99.1	73.0	102.1	73.7	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					333	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling				1935		
D. Inspection, maintenance or repair without refuelling				15		
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						4
Z. Others					30	
Subtotal	0	0	0	1950	371	8
Total	0			2329		

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		140
13. Reactor Auxiliary System:		28
14. Safety Systems		0
15. Reactor Cooling System:		9
16. Steam generation system:		114
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		11
41. Main Generator System:		6
42. Electrical Power Supply System:		10
Total	0	327

**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**  
**at the beginning of 2008:** 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 2008**

**Net Energy Production:** 2355.6 GW(e).h  
**Energy Availability Factor:** 23.1%  
**Load Factor:** 23.9%  
**Operating Factor:** 23.8%  
**Energy Unavailability Factor:** 76.9%  
**Total Off-line Time:** 6679 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	857.9	34.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	609.5	853.3	2355.6
<b>EAF (%)</b>	100.0	1.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	74.1	100.0	23.1
<b>UCF (%)</b>	100.0	1.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	74.1	100.0	23.1
<b>LF (%)</b>	102.3	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.1	101.8	23.9
<b>OF (%)</b>	100.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.6	100.0	23.8
<b>EUAF (%)</b>	0.0	99.0	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	25.9	0.0	76.9
<b>PUF (%)</b>	0.0	99.0	100.0	80.1	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	23.0
<b>UCLF (%)</b>	0.0	0.0	0.0	20.0	100.0	100.0	100.0	100.0	100.0	99.9	22.4	0.0	53.9
<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. 2008 Summary of Operation**

PERIODICAL INSPECTION AND REFUELING.(2008/2/2-2008/11/10)

**5. Historical Summary**

**Date of Construction Start:** 03 Oct 1987 **Lifetime Generation:** 137428.0 GW(e).h  
**Date of First Criticality:** 17 May 1991 **Cumulative Energy Availability Factor:** 80.9%  
**Date of Grid Connection:** 07 Jun 1991 **Cumulative Load Factor:** 81.7%  
**Date of Commercial Operation:** 18 Dec 1991 **Cumulative Unit Capability Factor:** 80.9%  
**Cumulative Energy Unavailability Factor:** 19.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1991	843.6	1127.0	100.0	100.0	100.0	100.0	100.6	100.6	744	100.0
1992	9954.7	1127.0	100.0	100.0	100.0	100.0	100.6	100.6	8784	100.0
1993	7863.7	1127.0	79.4	90.1	79.4	90.1	79.7	90.5	7025	80.2
1994	8139.1	1127.0	82.5	87.7	82.5	87.7	82.4	87.9	7265	82.9
1995	7701.7	1127.0	77.8	85.3	77.8	85.3	78.0	85.5	6887	78.6
1996	9957.4	1127.0	100.0	88.2	100.0	88.2	100.6	88.5	8784	100.0
1997	8333.0	1127.0	83.9	87.5	83.9	87.5	84.4	87.8	7385	84.3
1998	8872.7	1127.0	89.3	87.7	89.3	87.7	89.9	88.1	7867	89.8
1999	8892.3	1127.0	89.9	88.0	89.5	87.9	90.1	88.3	7875	89.9
2000	8868.9	1127.0	89.1	88.1	89.1	88.1	89.6	88.5	7824	89.1
2001	8474.7	1127.0	85.4	87.8	85.4	87.8	85.8	88.2	7481	85.4
2002	9918.7	1127.0	100.0	88.9	100.0	88.9	100.5	89.3	8760	100.0
2003	8683.2	1127.0	85.9	88.7	85.9	88.6	88.0	89.2	7525	85.9
2004	3040.2	1127.0	30.0	84.2	30.0	84.2	30.7	84.7	2634	30.0
2005	7834.0	1127.0	77.6	83.7	77.6	83.7	79.4	84.3	6968	79.5
2006	8012.3	1127.0	79.6	83.5	79.6	83.4	81.2	84.1	7001	79.9
2007	10080.1	1127.0	100.0	84.5	100.0	84.5	102.1	85.3	8760	100.0
2008	2355.6	1127.0	23.1	80.9	23.1	80.9	23.9	81.7	2081	23.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1993 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure C. Inspection, maintenance or repair combined with refuelling	1982	4721		975	381	
Subtotal	1982	4721	0	975	381	0
Total	6703			1356		

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

System	2008 Hours Lost	1993 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		349
13. Reactor Auxiliary System:		32
15. Reactor Cooling System:	4721	
Total	4721	381

## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7642.7 GW(e).h  
**Energy Availability Factor:** 75.3%  
**Load Factor:** 77.4%  
**Operating Factor:** 76.0%  
**Energy Unavailability Factor:** 24.7%  
**Total Off-line Time:** 2106 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	860.9	805.0	860.8	832.8	860.3	832.7	857.1	850.6	241.7	0.0	0.0	640.8	7642.7
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	29.3	0.1	0.0	75.0	75.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	29.3	0.1	0.0	75.0	75.3
<b>LF (%)</b>	102.7	106.3	102.7	102.8	102.6	102.6	102.2	101.4	29.8	0.0	0.0	76.4	77.4
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	29.9	0.0	0.0	78.4	76.0
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.7	99.9	100.0	25.0	24.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.3	99.9	100.0	25.0	24.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2008/9/9-2008/12/10)

### 5. Historical Summary

**Date of Construction Start:** 13 Jun 1988 **Lifetime Generation:** 134846.0 GW(e).h  
**Date of First Criticality:** 28 May 1992 **Cumulative Energy Availability Factor:** 84.6%  
**Date of Grid Connection:** 19 Jun 1992 **Cumulative Load Factor:** 85.8%  
**Date of Commercial Operation:** 02 Feb 1993 **Cumulative Unit Capability Factor:** 84.6%  
**Cumulative Energy Unavailability Factor:** 15.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1993	9079.7	1127.0	100.0	100.0	100.0	100.0	100.5	100.5	8016	100.0
1994	7851.5	1127.0	79.7	89.4	79.7	89.4	79.5	89.6	7063	80.6
1995	7495.1	1127.0	75.6	84.7	75.6	84.7	75.9	84.9	6695	76.4
1996	7051.1	1127.0	70.8	81.1	70.8	81.1	71.2	81.4	6221	70.8
1997	7660.2	1127.0	77.1	80.3	77.1	80.3	77.6	80.6	6756	77.1
1998	8839.4	1127.0	89.0	81.8	89.0	81.8	89.5	82.1	7835	89.4
1999	8903.4	1127.0	89.9	82.9	89.5	82.9	90.2	83.3	7872	89.9
2000	8649.8	1127.0	86.8	83.4	86.8	83.4	87.4	83.8	7629	86.9
2001	9283.6	1127.0	93.4	84.5	93.4	84.5	94.0	84.9	8179	93.4
2002	9217.1	1127.0	91.5	85.2	91.5	85.2	93.4	85.8	8017	91.5
2003	8762.6	1127.0	86.3	85.3	86.3	85.3	88.8	86.1	7557	86.3
2004	8318.2	1127.0	81.8	85.0	81.8	85.0	84.0	85.9	7186	81.8
2005	9929.0	1127.0	98.8	86.1	98.8	86.1	100.6	87.0	8657	98.8
2006	8163.9	1127.0	80.7	85.7	80.7	85.7	82.7	86.7	7087	80.9
2007	7978.6	1127.0	78.9	85.3	78.9	85.2	80.8	86.3	6934	79.2
2008	7642.7	1127.0	75.3	84.6	75.3	84.6	77.4	85.8	6654	76.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1994 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		56			213	
C. Inspection, maintenance or repair combined with refuelling	2081			1017		
Z. Others					38	
Subtotal	2081	56	0	1017	251	0
Total	2137			1268		

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

System	2008 Hours Lost	1994 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	56	
41. Main Generator Systems		213
Total	56	213

**JP-22 ONAGAWA-1**

**Operator:** TOHOKU (TOHOKU ELECTRIC POWER CO.,INC)  
**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

**1. Station Details**

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008**

**Net Energy Production:** 530.8 GW(e).h  
**Energy Availability Factor:** 11.8%  
**Load Factor:** 12.2%  
**Operating Factor:** 12.1%  
**Energy Unavailability Factor:** 88.2%  
**Total Off-line Time:** 7703 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	374.4	156.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	530.8
<b>EAF (%)</b>	100.0	42.7	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	11.8
<b>UCF (%)</b>	100.0	42.7	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	11.8
<b>LF (%)</b>	101.0	46.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2
<b>OF (%)</b>	100.0	46.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1
<b>EUF (%)</b>	0.0	57.3	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	88.2
<b>PUF (%)</b>	0.0	57.3	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	74.2	86.0
<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	25.8	2.2
<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. 2008 Summary of Operation**

PERIODICAL INSPECTION AND REFUELING.(2008/2/13-12/23)EXTENSION OF PERIODICAL INSPECTION.(2008/12/24-)

**5. Historical Summary**

**Date of Construction Start:** 08 Jul 1980 **Lifetime Generation:** 75135.0 GW(e).h  
**Date of First Criticality:** 18 Oct 1983 **Cumulative Energy Availability Factor:** 67.1%  
**Date of Grid Connection:** 18 Nov 1983 **Cumulative Load Factor:** 67.2%  
**Date of Commercial Operation:** 01 Jun 1984 **Cumulative Unit Capability Factor:** 68.9%  
**Cumulative Energy Unavailability Factor:** 32.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	2519.8	496.0	98.9	98.9	98.9	98.9	98.9	98.9	5136	100.0
1985	3259.2	496.0	75.6	84.2	75.6	84.2	75.0	83.8	6681	76.3
1986	3366.6	496.0	77.9	81.8	77.9	81.8	77.5	81.4	6871	78.4
1987	3161.7	497.0	72.8	79.3	72.8	79.3	72.6	78.9	6500	74.2
1988	3410.6	496.0	78.6	79.1	78.6	79.1	78.3	78.8	6949	79.1
1989	3013.7	497.0	69.1	77.3	69.1	77.3	69.2	77.1	6177	70.5
1990	2850.7	497.0	65.6	75.5	65.6	75.5	65.5	75.3	5908	67.4
1991	3345.9	497.0	77.0	75.7	77.0	75.7	76.9	75.5	6954	79.4
1992	4120.5	497.0	94.7	78.0	94.7	77.9	94.4	77.7	8342	95.0
1993	2300.1	497.0	52.0	75.2	50.6	75.1	52.8	75.1	4666	53.3
1994	3428.8	497.0	78.7	75.6	78.6	75.4	78.8	75.5	6961	79.5
1995	2936.4	497.0	68.2	74.9	67.8	74.8	67.4	74.8	6000	68.5
1996	3727.2	498.0	85.6	75.8	85.6	75.6	85.2	75.6	7523	85.6
1997	3304.6	498.0	76.2	75.8	76.2	75.7	75.8	75.6	6708	76.6
1998	3359.5	498.0	76.9	75.9	76.9	75.8	77.0	75.7	6841	78.1
1999	4240.2	498.0	97.2	77.3	97.2	77.1	97.2	77.1	8517	97.2
2000	3689.1	498.0	84.6	77.7	84.6	77.6	84.3	77.5	7436	84.7
2001	3425.1	498.0	78.5	77.8	78.4	77.6	78.5	77.6	6873	78.5
2002	3143.2	498.0	68.5	77.3	68.5	77.1	72.1	77.3	6001	68.5
2003	1856.1	498.0	42.5	75.5	42.5	75.4	42.5	75.5	3725	42.5
2004	2998.9	498.0	68.6	75.1	68.5	75.0	68.6	75.2	6020	68.5
2005	1898.6	498.0	80.8	75.4	43.1	73.6	43.5	73.7	3799	43.4
2006	0.0	498.0	4.8	72.3	0.0	70.3	0.0	70.4	0	0.0
2007	2162.2	498.0	49.3	71.3	49.3	69.4	49.6	69.6	4351	49.7
2008	530.8	498.0	11.8	68.9	11.8	67.1	12.2	67.2	1057	12.1



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					402	
C. Inspection, maintenance or repair combined with refuelling	7535	192		1357		
D. Inspection, maintenance or repair without refuelling				265		
E. Testing of plant systems or component:					405	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						4
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						154
Subtotal	7535	192	0	1622	807	158
Total		7727			2587	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
14. Safety Systems		101
15. Reactor Cooling System:		203
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		61
42. Electrical Power Supply System:		5
Total	0	400

## JP-54 ONAGAWA-2

Operator: TOHOKU (TOHOKU ELECTRIC POWER CO.,INC)

Contractor: TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 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 2008

Net Energy Production: 6453.4 GW(e).h

Energy Availability Factor: 91.7%

Load Factor: 92.5%

Operating Factor: 92.3%

Energy Unavailability Factor: 8.3%

Total Off-line Time: 674 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	19.5	553.2	597.6	578.4	595.9	577.3	596.0	594.2	575.5	594.4	575.9	595.6	6453.4
EAF (%)	3.4	99.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.7
UCF (%)	3.4	99.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.7
LF (%)	3.3	103.4	100.9	101.1	100.6	100.7	100.6	100.3	100.4	100.2	100.5	100.6	92.5
OF (%)	6.2	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	92.3
EUF (%)	96.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3
PUF (%)	95.3	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2
UCLF (%)	1.3	0.0	0.0	0.0	0.0	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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2007/10/15-2008/1/29)EXTENSION OF PERIODICAL INSPECTION.(2008/1/30)OPERATION AT FULL POWER IN BASE LOAD.(2008/2/4-)

### 5. Historical Summary

Date of Construction Start: 12 Apr 1991      Lifetime Generation: 71829.0 GW(e).h

Date of First Criticality: 02 Nov 1994      Cumulative Energy Availability Factor: 75.0%

Date of Grid Connection: 23 Dec 1994      Cumulative Load Factor: 75.1%

Date of Commercial Operation: 28 Jul 1995      Cumulative Unit Capability Factor: 78.0%

   Cumulative Energy Unavailability Factor: 25.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1995	3261.4	796.0	93.4	93.4	93.4	93.4	92.8	92.8	4149	94.0
1996	5175.3	796.0	74.4	80.8	74.4	80.8	74.0	80.3	6545	74.5
1997	6931.6	796.0	99.9	88.4	99.9	88.4	99.4	87.9	8760	100.0
1998	5647.7	796.0	81.1	86.3	81.1	86.3	81.0	85.9	7185	82.0
1999	5841.2	796.0	84.2	85.9	84.2	85.9	83.8	85.5	7383	84.3
2000	5858.6	796.0	84.2	85.6	84.2	85.6	83.8	85.2	7402	84.3
2001	6521.2	796.0	94.0	86.9	94.0	86.9	93.5	86.4	8238	94.0
2002	5242.9	796.0	72.4	84.9	72.4	84.9	75.2	84.9	6368	72.7
2003	3272.4	796.0	47.3	80.5	47.2	80.5	46.9	80.5	4139	47.2
2004	7040.4	796.0	100.0	82.6	100.0	82.6	100.7	82.6	8784	100.0
2005	1877.3	796.0	64.5	80.8	26.8	77.2	26.9	77.3	2367	27.0
2006	2484.7	796.0	38.9	77.2	35.6	73.6	35.6	73.7	3188	36.4
2007	5184.6	796.0	73.8	76.9	73.8	73.6	74.4	73.7	6491	74.1
2008	6453.4	796.0	91.7	78.0	91.7	75.0	92.5	75.1	8086	92.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1995 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					671	
C. Inspection, maintenance or repair combined with refuelling	696	11		1057		
D. Inspection, maintenance or repair without refuelling				44		
E. Testing of plant systems or component:					13	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						256
Subtotal	696	11	0	1101	684	256
Total		707			2041	

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

System	2008 Hours Lost	1995 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		56
12. Reactor I&C Systems		131
13. Reactor Auxiliary System:		113
15. Reactor Cooling System:		290
31. Turbine and auxiliaries		24
32. Feedwater and Main Steam System		54
Total	0	668

## JP-57 ONAGAWA-3

**Operator:** TOHOKU (TOHOKU ELECTRIC POWER CO.,INC)

**Contractor:** TOSHIBA (TOSHIBA CORPORATION)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6502.2 GW(e).h  
**Energy Availability Factor:** 90.1%  
**Load Factor:** 93.2%  
**Operating Factor:** 90.4%  
**Energy Unavailability Factor:** 9.9%  
**Total Off-line Time:** 839 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	612.9	572.6	611.1	591.0	611.1	592.7	611.4	609.8	590.4	610.5	488.8	0.0	6502.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.8	0.0	90.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.8	0.0	90.1
<b>LF (%)</b>	103.5	107.0	103.2	103.3	103.2	103.4	103.2	103.0	103.0	102.9	85.3	0.0	93.2
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	83.5	0.0	90.4
<b>EUAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2	100.0	9.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2	100.0	9.9
<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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2008/11/25-)

### 5. Historical Summary

**Date of Construction Start:** 23 Jan 1998      **Lifetime Generation:** 33676.0 GW(e).h  
**Date of First Criticality:** 26 Apr 2001      **Cumulative Energy Availability Factor:** 68.6%  
**Date of Grid Connection:** 30 May 2001      **Cumulative Load Factor:** 69.5%  
**Date of Commercial Operation:** 30 Jan 2002      **Cumulative Unit Capability Factor:** 70.4%  
**Cumulative Energy Unavailability Factor:** 31.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2002	6652.5	796.0	100.0	100.0	100.0	100.0	95.4	95.4	8064	92.1
2003	5978.2	796.0	84.7	92.3	83.7	91.9	85.7	90.6	7332	83.7
2004	5348.7	796.0	74.6	86.4	74.4	86.0	76.5	85.9	6548	74.5
2005	4381.8	796.0	72.7	83.0	61.2	79.8	62.8	80.1	5460	62.3
2006	2798.1	796.0	39.0	74.2	39.0	71.7	40.1	72.1	3476	39.7
2007	2261.4	796.0	31.7	67.1	31.7	65.0	32.4	65.5	2887	33.0
2008	6502.2	796.0	90.1	70.4	90.1	68.6	93.2	69.5	7921	90.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2003 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					332	
C. Inspection, maintenance or repair combined with refuelling	863			1383	325	
D. Inspection, maintenance or repair without refuelling					565	
E. Testing of plant systems or component:					170	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						181
Z. Others					76	
Subtotal	863	0	0	1383	1468	181
Total	863			3032		

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

System	2008 Hours Lost	2003 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		94
31. Turbine and auxiliaries		74
32. Feedwater and Main Steam System		163
Total	0	331

**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**

**at the beginning of 2008:** 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 2008**

**Net Energy Production:** 5665.1 GW(e).h

**Energy Availability Factor:** 71.9%

**Load Factor:** 76.2%

**Operating Factor:** 72.8%

**Energy Unavailability Factor:** 28.1%

**Total Off-line Time:** 2388 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	669.4	628.5	672.1	648.9	668.3	645.1	658.1	123.8	0.0	0.0	278.6	672.3	5665.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	19.1	0.0	0.0	44.4	100.0	71.9
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	19.1	0.0	0.0	44.4	100.0	71.9
<b>LF (%)</b>	106.4	106.7	106.8	106.5	106.2	105.9	104.6	19.7	0.0	0.0	45.7	106.8	76.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	19.5	0.0	0.0	54.9	100.0	72.8
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.9	100.0	100.0	55.6	0.0	28.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.9	100.0	100.0	55.6	0.0	28.1
<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. 2008 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 15 Dec 1979      **Lifetime Generation:** 157137.0 GW(e).h

**Date of First Criticality:** 25 Aug 1983      **Cumulative Energy Availability Factor:** 81.8%

**Date of Grid Connection:** 16 Sep 1983      **Cumulative Load Factor:** 83.2%

**Date of Commercial Operation:** 04 Jul 1984      **Cumulative Unit Capability Factor:** 81.8%

**Cumulative Energy Unavailability Factor:** 18.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	3775.4	846.0	100.0	100.0	100.0	100.0	101.1	101.1	4416	100.0
1985	5890.3	846.0	78.7	85.8	78.7	85.8	79.5	86.7	6964	79.5
1986	6084.0	846.0	81.4	84.0	81.4	84.0	82.1	84.9	7224	82.5
1987	6113.4	846.0	81.7	83.4	81.7	83.4	82.5	84.2	7261	82.9
1988	5683.1	846.0	75.8	81.7	75.8	81.7	76.5	82.5	6756	76.9
1989	7381.3	846.0	98.7	84.8	98.7	84.8	99.6	85.6	8641	98.6
1990	6155.0	846.0	82.3	84.4	82.3	84.4	83.1	85.2	7307	83.4
1991	5590.7	846.0	74.8	83.1	74.8	83.1	75.4	83.9	6684	76.3
1992	5713.9	846.0	76.1	82.3	76.1	82.3	76.9	83.1	6780	77.2
1993	6619.2	846.0	88.4	82.9	88.4	82.9	89.3	83.7	7753	88.5
1994	5778.3	846.0	77.2	82.4	77.2	82.4	78.0	83.2	6762	77.2
1995	5780.3	846.0	77.3	81.9	77.3	81.9	78.0	82.7	6863	78.3
1996	5185.4	846.0	69.1	80.9	69.1	80.9	69.8	81.7	6157	70.1
1997	7216.7	846.0	96.4	82.1	96.4	82.1	97.4	82.9	8449	96.4
1998	5291.2	846.0	70.6	81.3	70.6	81.3	71.4	82.1	6311	72.0
1999	6057.6	846.0	80.8	81.2	80.8	81.2	81.7	82.0	7082	80.8
2000	5654.0	846.0	75.2	80.9	75.2	80.9	76.1	81.7	6609	75.2
2001	7367.0	846.0	98.3	81.9	98.3	81.9	99.4	82.7	8614	98.3
2002	6323.0	846.0	83.7	82.0	83.7	82.0	85.3	82.8	7333	83.7
2003	6282.1	846.0	83.1	82.0	83.1	82.0	84.8	82.9	7278	83.1
2004	6080.8	846.0	80.1	81.9	80.1	81.9	81.8	82.9	7043	80.2
2005	7155.8	846.0	94.7	82.5	94.7	82.5	96.6	83.5	8305	94.8
2006	6436.6	846.0	82.9	82.5	82.9	82.5	86.9	83.7	7330	83.7
2007	5868.9	846.0	75.2	82.2	75.2	82.2	79.2	83.5	6660	76.0
2008	5665.1	846.0	71.9	81.8	71.9	81.8	76.2	83.2	6396	72.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure C. Inspection, maintenance or repair combined with refuelling	2395			1425	76	
Subtotal	2395	0	0	1425	76	0
Total	2395			1501		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary System:		11
16. Steam generation system:		28
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		26
Total	0	76

**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 at the beginning of 2008:** 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 2008**

**Net Energy Production:** 6824.3 GW(e).h

**Energy Availability Factor:** 89.8%

**Load Factor:** 92.1%

**Operating Factor:** 90.1%

**Energy Unavailability Factor:** 10.2%

**Total Off-line Time:** 863 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	642.4	603.1	645.4	624.7	645.2	624.6	640.4	639.0	620.9	642.6	496.2	0.0	6824.3
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.7	0.0	89.8
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.7	0.0	89.8
<b>LF (%)</b>	102.1	106.1	102.5	102.7	102.5	102.5	101.7	101.5	101.9	102.0	81.5	0.0	92.1
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	80.1	0.0	90.1
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.3	100.0	10.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.3	100.0	10.2
<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	0.0	0.0	0.0

UCLF replaces previously used UUF.

**4. 2008 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 12 Oct 1981      **Lifetime Generation:** 143866.0 GW(e).h

**Date of First Criticality:** 18 Mar 1985      **Cumulative Energy Availability Factor:** 83.7%

**Date of Grid Connection:** 05 Apr 1985      **Cumulative Load Factor:** 84.9%

**Date of Commercial Operation:** 28 Nov 1985      **Cumulative Unit Capability Factor:** 83.7%

**Cumulative Energy Unavailability Factor:** 16.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	1252.9	846.0	100.0	100.0	100.0	100.0	101.2	101.2	1464	100.0
1986	5996.4	846.0	80.1	83.0	80.1	83.0	80.9	83.8	7112	81.2
1987	6080.6	846.0	81.2	82.2	81.2	82.2	82.0	83.0	7211	82.3
1988	7409.8	846.0	98.7	87.4	98.7	87.4	99.7	88.3	8665	98.6
1989	4999.4	846.0	66.8	82.5	66.8	82.5	67.5	83.3	5950	67.9
1990	6160.1	846.0	82.4	82.4	82.4	82.4	83.1	83.3	7309	83.4
1991	5665.3	846.0	75.7	81.4	75.7	81.4	76.4	82.2	6732	76.8
1992	7385.3	846.0	98.3	83.7	98.3	83.7	99.4	84.6	8639	98.3
1993	5822.0	846.0	77.7	83.0	77.7	83.0	78.6	83.8	6632	75.7
1994	5568.8	846.0	74.3	82.0	74.3	82.0	75.1	82.9	6557	74.9
1995	5658.4	846.0	75.5	81.4	75.5	81.4	76.4	82.2	6709	76.6
1996	7359.3	846.0	98.0	82.9	98.0	82.9	99.0	83.7	8617	98.1
1997	5950.3	846.0	79.4	82.6	79.4	82.6	80.3	83.5	7034	80.3
1998	5899.1	846.0	78.7	82.3	78.7	82.3	79.6	83.2	6973	79.6
1999	5658.3	846.0	75.5	81.8	75.5	81.8	76.4	82.7	6612	75.5
2000	7370.2	846.0	98.0	82.9	98.0	82.9	99.2	83.8	8614	98.1
2001	6210.2	846.0	82.9	82.9	82.9	82.9	83.8	83.8	7260	82.9
2002	6255.5	846.0	82.8	82.9	82.8	82.9	84.4	83.8	7257	82.8
2003	6348.8	846.0	83.4	82.9	83.4	82.9	85.7	83.9	7315	83.5
2004	6762.5	846.0	88.5	83.2	88.5	83.2	91.0	84.3	7774	88.5
2005	6752.8	846.0	88.9	83.5	88.9	83.5	91.1	84.6	7895	90.1
2006	6464.2	846.0	85.3	83.6	85.3	83.6	87.2	84.7	7548	86.2
2007	5989.3	846.0	79.0	83.4	79.0	83.4	80.8	84.6	6996	79.9
2008	6824.3	846.0	89.8	83.7	89.8	83.7	92.1	84.9	7897	90.1



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure C. Inspection, maintenance or repair combined with refuelling	893			1397	5	
Subtotal	893	0	0	1397	5	0
Total	893			1402		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
32. Feedwater and Main Steam System		5
Total	0	5

**JP-48 SHIKA-1**

Operator: HOKURIKU (HOKURIKU ELECTRIC POWER CO.)

Contractor: HITACHI (HITACHI LTD.)

**1. Station Details**

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 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 2008**

Net Energy Production: 0.0 GW(e).h

Energy Availability Factor: -0.3%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.3%

Total Off-line Time: 8760 hours

**3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
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. 2008 Summary of Operation**

UNIT SHUTDOWN FOR INSPECTION AND SAFETY MEASURE

**5. Historical Summary**

Date of Construction Start: 01 Jul 1989      Lifetime Generation: 49186.0 GW(e).h

Date of First Criticality: 20 Nov 1992      Cumulative Energy Availability Factor: 71.0%

Date of Grid Connection: 12 Jan 1993      Cumulative Load Factor: 70.6%

Date of Commercial Operation: 30 Jul 1993      Cumulative Unit Capability Factor: 71.0%

   Cumulative Energy Unavailability Factor: 29.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1993	2068.5	505.0	99.8	99.8	99.8	99.8	92.8	92.8	4130	93.5
1994	3312.4	505.0	75.0	83.3	75.0	83.3	74.9	80.9	6584	75.2
1995	3497.2	505.0	79.0	81.6	79.0	81.6	79.1	80.1	6974	79.6
1996	3454.7	505.0	77.9	80.6	77.9	80.6	77.9	79.5	6848	78.0
1997	4431.8	505.0	100.0	84.9	100.0	84.9	100.2	84.1	8760	100.0
1998	3530.6	505.0	80.0	84.0	80.0	84.0	79.8	83.3	7047	80.4
1999	3325.7	505.0	75.4	82.7	75.4	82.7	75.2	82.1	6607	75.4
2000	3763.1	505.0	84.9	83.0	84.9	83.0	84.8	82.4	7462	84.9
2001	4427.4	505.0	100.0	85.0	100.0	85.0	100.1	84.5	8760	100.0
2002	3537.1	505.0	80.0	84.4	80.0	84.4	80.0	84.0	7010	80.0
2003	1523.8	505.0	34.6	79.7	34.6	79.7	34.4	79.3	3029	34.6
2004	3534.9	505.0	78.8	79.6	78.8	79.6	79.7	79.3	6958	79.2
2005	4203.8	505.0	100.0	81.2	100.0	81.2	95.0	80.6	8226	93.9
2006	2908.1	505.0	65.3	80.1	65.3	80.1	65.7	79.5	5777	65.9
2007	908.4	505.0	20.2	75.9	20.2	75.9	20.5	75.4	1778	20.3
2008	0.0	505.0	-0.3	71.0	-0.3	71.0	0.0	70.6	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1994 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					122	
C. Inspection, maintenance or repair combined with refuelling				1721		
D. Inspection, maintenance or repair without refuelling	8784					
E. Testing of plant systems or component:				137		
H. Nuclear regulatory requirement					43	
J. Grid limitation, failure or grid unavailability						40
Subtotal	8784	0	0	1858	165	40
Total	8784			2063		

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

System	2008 Hours Lost	1994 to 2008 Average Hours Lost Per Year
15. Reactor Cooling System:		63
31. Turbine and auxiliaries:		10
41. Main Generator System:		28
42. Electrical Power Supply System:		20
Total	0	121

## JP-59 SHIKA-2

Operator: HOKURIKU (HOKURIKU ELECTRIC POWER CO.)

Contractor: HITACHI (HITACHI LTD.)

### 1. Station Details

Type: BWR

Net Reference Unit Power at the beginning of 2008: 1304.0 MW(e)

Design Net Capacity: 1304.0 MW(e)

Design Discharge Burnup: 41000 MW.d/t

Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 6381.9 GW(e).h

Energy Availability Factor: 58.5%

Load Factor: 61.1%

Operating Factor: 63.9%

Energy Unavailability Factor: 41.5%

Total Off-line Time: 3174 hours

### 3. 2008 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	429.4	834.4	861.5	861.9	834.4	862.8	834.7	862.9	6381.9
EAF (%)	0.0	0.0	0.0	0.0	45.2	98.2	100.0	100.0	100.0	100.0	100.0	100.0	58.5
UCF (%)	0.0	0.0	0.0	0.0	45.2	98.2	100.0	100.0	100.0	100.0	100.0	100.0	58.5
LF (%)	0.0	0.0	0.0	0.0	44.3	104.6	104.5	104.6	104.6	104.7	104.6	104.7	61.1
OF (%)	0.0	0.0	0.0	3.9	59.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.9
EUUF (%)	100.0	100.0	100.0	100.0	54.8	1.8	0.0	0.0	0.0	0.0	0.0	0.0	41.5
PUF (%)	100.0	100.0	100.0	1.9	3.9	1.8	0.0	0.0	0.0	0.0	0.0	0.0	27.9
UCLF (%)	0.0	0.0	0.0	98.1	50.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5
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. 2008 Summary of Operation

INSTALLING THE PRESSURE PLATES, RATED OUTPUT OF ELECTRIC POWER DECLINED FROM 1304MW TO 1108MW ON JUNE 5,2008.

### 5. Historical Summary

Date of Construction Start: 20 Aug 2001      Lifetime Generation: 12962.0 GW(e).h

Date of First Criticality: 26 May 2005      Cumulative Energy Availability Factor: 32.0%

Date of Grid Connection: 04 Jul 2005      Cumulative Load Factor: 32.9%

Date of Commercial Operation: 15 Mar 2006      Cumulative Unit Capability Factor: 32.0%

   Cumulative Energy Unavailability Factor: 68.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2006	3953.9	1304.0	41.1	41.1	41.1	41.1	41.3	41.3	3030	41.3
2007	0.0	1304.0	0.0	18.8	0.0	18.8	0.0	18.8	0	0.0
2008	6381.9	1108.0	58.5	32.0	58.5	32.0	61.1	32.9	5610	63.9

### 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2006 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		941				
C. Inspection, maintenance or repair combined with refuelling	2196					
E. Testing of plant systems or component				302		
H. Nuclear regulatory requirement					4358	
Subtotal	2196	941	0	302	4358	0
Total		3137			4660	

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

System	2008 Hours Lost	2006 to 2008 Average Hours Lost Per Year
31. Turbine and auxiliaries	941	
Total	941	0

## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2738.4 GW(e).h  
**Energy Availability Factor:** 69.6%  
**Load Factor:** 71.2%  
**Operating Factor:** 70.1%  
**Energy Unavailability Factor:** 30.4%  
**Total Off-line Time:** 2618 hours

### 3. 2008 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	111.0	335.2	323.2	330.2	328.3	320.9	332.2	322.8	334.7	2738.4
<b>EAF (%)</b>	0.0	-3.6	0.0	33.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	69.6
<b>UCF (%)</b>	0.0	-3.6	0.0	33.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	69.6
<b>LF (%)</b>	0.0	0.0	0.0	35.2	102.6	102.3	101.1	100.5	101.5	101.6	102.1	102.5	71.2
<b>OF (%)</b>	0.0	0.0	0.0	36.4	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	70.1
<b>EUF (%)</b>	100.0	103.6	100.0	66.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.4
<b>PUF (%)</b>	100.0	103.6	100.0	66.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.4
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	02 Jul 1970	<b>Lifetime Generation:</b>	98363.0 GW(e).h
<b>Date of First Criticality:</b>	01 Jun 1973	<b>Cumulative Energy Availability Factor:</b>	73.0%
<b>Date of Grid Connection:</b>	02 Dec 1973	<b>Cumulative Load Factor:</b>	73.2%
<b>Date of Commercial Operation:</b>	29 Mar 1974	<b>Cumulative Unit Capability Factor:</b>	73.1%
		<b>Cumulative Energy Unavailability Factor:</b>	27.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	2756.2	440.0	84.0	84.0	84.0	84.0	85.3	85.3	6387	87.0
1975	2946.1	439.0	78.7	81.1	78.7	81.1	76.6	80.6	7010	80.0
1976	2802.9	439.0	72.7	78.2	72.7	78.2	72.7	77.8	6697	76.2
1977	1879.1	439.0	48.9	70.6	48.9	70.6	48.9	70.3	4489	51.2
1978	2701.8	439.0	70.3	70.5	70.3	70.5	70.3	70.3	6394	73.0
1979	2623.6	439.0	68.4	70.1	68.4	70.1	68.2	69.9	6341	72.4
1980	2734.6	439.0	70.9	70.2	70.9	70.2	70.9	70.1	6466	73.6
1981	2293.1	439.0	57.0	68.5	57.0	68.5	59.6	68.7	5430	62.0
1982	2366.8	439.0	61.5	67.7	61.5	67.7	61.5	67.9	5499	62.8
1983	2696.1	439.0	70.1	68.0	70.1	68.0	70.1	68.1	6268	71.6
1984	2990.7	439.0	78.2	68.9	78.2	68.9	77.6	69.0	6912	78.7
1985	3790.4	439.0	100.0	71.6	99.1	71.5	98.6	71.5	8705	99.4
1986	2130.5	439.0	55.5	70.3	55.5	70.2	55.4	70.3	4903	56.0
1987	3011.2	439.0	79.4	71.0	78.6	70.8	78.3	70.8	6937	79.2
1988	2355.1	439.0	61.1	70.3	61.1	70.2	61.1	70.2	5398	61.5
1989	2616.3	439.0	68.1	70.2	68.1	70.0	68.0	70.0	5965	68.1
1990	3745.5	439.0	97.4	71.8	97.4	71.7	97.4	71.7	8565	97.8
1991	3111.3	439.0	80.9	72.3	80.9	72.2	80.9	72.2	7123	81.3
1992	2671.3	439.0	73.4	72.3	69.4	72.0	69.3	72.0	6134	69.8
1993	2549.1	439.0	66.5	72.0	66.5	71.7	66.3	71.7	5849	66.8
1994	2948.0	439.0	76.7	72.3	76.7	72.0	76.7	72.0	6733	76.9
1995	2984.6	439.0	78.1	72.5	78.1	72.3	77.6	72.2	6862	78.3
1996	2245.5	439.0	58.4	71.9	58.4	71.7	58.2	71.6	5154	58.7
1997	2923.6	439.0	76.2	72.1	76.2	71.8	76.0	71.8	6712	76.6
1998	3845.4	439.0	100.0	73.2	100.0	73.0	100.0	72.9	8760	100.0
1999	3359.3	439.0	87.4	73.8	87.4	73.5	87.4	73.5	7657	87.4
2000	1381.2	439.0	35.8	72.3	35.8	72.1	35.8	72.1	3149	35.8
2001	2844.6	439.0	74.1	72.4	74.1	72.2	74.0	72.2	6488	74.1
2002	3393.2	439.0	88.2	73.0	88.2	72.8	88.2	72.7	7730	88.2
2003	2749.0	439.0	71.4	72.9	71.4	72.7	71.5	72.7	6253	71.4
2004	3937.9	439.0	100.0	73.8	100.0	73.6	102.1	73.6	8784	100.0
2005	2382.3	439.0	60.8	73.4	60.8	73.2	61.9	73.3	5349	61.1
2006	2699.5	439.0	68.7	73.2	68.7	73.1	70.2	73.2	6025	68.8
2007	2866.6	439.0	73.4	73.2	73.4	73.1	74.5	73.2	6441	73.5
2008	2738.4	439.0	69.6	73.1	69.6	73.0	71.2	73.2	6142	70.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 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	2655			1995		
D. Inspection, maintenance or repair without refuelling				70		
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					9	
Z. Others					11	
Subtotal	2655	0	0	2065	132	3
Total	2655			2200		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
14. Safety Systems		4
15. Reactor Cooling System:		72
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		34
Total	0	111

**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**

**at the beginning of 2008:** 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 2008**

**Net Energy Production:** 4703.6 GW(e).h

**Energy Availability Factor:** 68.2%

**Load Factor:** 68.1%

**Operating Factor:** 68.5%

**Energy Unavailability Factor:** 31.8%

**Total Off-line Time:** 2759 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	588.7	551.0	588.3	567.7	586.0	564.6	575.7	571.8	109.8	0.0	0.0	0.0	4703.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	19.6	0.1	0.0	0.0	68.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	19.6	0.1	0.0	0.0	68.2
<b>LF (%)</b>	100.3	103.9	100.2	100.1	99.8	99.4	98.1	97.4	19.3	0.0	0.0	0.0	68.1
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	20.1	0.0	0.0	0.0	68.5
<b>EUAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	80.4	99.9	100.0	100.0	31.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	80.4	99.9	83.3	100.0	30.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	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. 2008 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 02 Feb 1985      **Lifetime Generation:** 114466.0 GW(e).h

**Date of First Criticality:** 25 May 1988      **Cumulative Energy Availability Factor:** 82.0%

**Date of Grid Connection:** 11 Jul 1988      **Cumulative Load Factor:** 81.9%

**Date of Commercial Operation:** 10 Feb 1989      **Cumulative Unit Capability Factor:** 82.1%

**Cumulative Energy Unavailability Factor:** 18.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	5628.8	790.0	89.2	89.2	89.2	89.2	88.8	88.8	7179	89.6
1990	5123.5	790.0	74.0	81.3	74.0	81.3	74.0	81.1	6592	75.3
1991	5544.5	790.0	80.1	80.9	80.1	80.9	80.1	80.8	7121	81.3
1992	5516.1	790.0	79.7	80.6	79.7	80.6	79.5	80.4	7072	80.5
1993	6756.9	790.0	97.8	84.1	97.8	84.1	97.6	83.9	8592	98.1
1994	5547.3	790.0	80.6	83.5	80.6	83.5	80.2	83.3	7071	80.7
1995	5363.6	790.0	77.9	82.7	77.9	82.7	77.5	82.5	6888	78.6
1996	5583.7	790.0	80.8	82.4	80.8	82.4	80.5	82.2	7166	81.6
1997	6903.2	789.0	100.0	84.4	100.0	84.4	99.9	84.2	8760	100.0
1998	5962.5	789.0	86.5	84.6	86.5	84.6	86.3	84.4	7600	86.8
1999	5758.7	789.0	83.5	84.5	83.5	84.5	83.3	84.3	7319	83.6
2000	6084.0	789.0	88.2	84.8	88.1	84.8	87.8	84.6	7747	88.2
2001	6901.0	789.0	100.0	86.0	100.0	86.0	99.8	85.8	8760	100.0
2002	6055.1	789.0	87.6	86.1	87.6	86.1	87.6	85.9	7678	87.6
2003	4836.2	789.0	70.1	85.0	70.0	85.0	70.0	84.8	6133	70.0
2004	4097.6	789.0	59.0	83.4	59.0	83.4	59.1	83.2	5202	59.2
2005	5907.5	789.0	85.6	83.5	85.4	83.5	85.5	83.3	7544	86.1
2006	5085.4	789.0	73.6	83.0	73.6	82.9	73.6	82.8	6469	73.8
2007	5462.0	789.0	79.5	82.8	79.5	82.8	79.0	82.6	6970	79.6
2008	4703.6	789.0	68.2	82.1	68.2	82.0	68.1	81.9	6001	68.5



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		120			144	
B. Refuelling without a maintenance outage					5	
C. Inspection, maintenance or repair combined with refuelling	2663			1212	7	
D. Inspection, maintenance or repair without refuelling				5		
H. Nuclear regulatory requirement					1	
Z. Others					29	
Subtotal	2663	120	0	1217	186	0
Total		2783			1403	

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	120	
12. Reactor I&C Systems		5
13. Reactor Auxiliary System:		18
15. Reactor Cooling System:		79
Total	120	102

## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 4935.8 GW(e).h  
**Energy Availability Factor:** 68.8%  
**Load Factor:** 72.2%  
**Operating Factor:** 69.4%  
**Energy Unavailability Factor:** 31.2%  
**Total Off-line Time:** 2683 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	610.2	571.3	367.2	0.0	0.0	0.0	392.3	598.3	584.2	608.6	591.5	612.1	4935.8
<b>EAF (%)</b>	100.0	100.0	60.1	-0.1	0.0	0.0	65.6	100.0	100.0	100.0	100.0	100.0	68.8
<b>UCF (%)</b>	100.0	100.0	60.2	-0.1	0.0	0.0	65.6	100.0	100.0	100.0	100.0	100.0	68.8
<b>LF (%)</b>	105.1	109.0	63.3	0.0	0.0	0.0	67.6	103.1	104.0	104.7	105.3	105.5	72.2
<b>OF (%)</b>	100.0	103.6	60.8	0.0	0.0	0.0	69.0	100.0	100.0	99.9	100.0	100.0	69.4
<b>EUF (%)</b>	0.0	0.0	39.9	100.1	100.0	100.0	34.4	0.0	0.0	0.0	0.0	0.0	31.2
<b>PUF (%)</b>	0.0	0.0	5.0	100.1	100.0	100.0	34.4	0.0	0.0	0.0	0.0	0.0	28.3
<b>UCLF (%)</b>	0.0	0.0	34.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2008/3/19-2008/7/12)

## 5. Historical Summary

**Date of Construction Start:** 25 Apr 1970  
**Date of First Criticality:** 14 Mar 1974  
**Date of Grid Connection:** 27 Mar 1974  
**Date of Commercial Operation:** 14 Nov 1974

**Lifetime Generation:** 161066.0 GW(e).h  
**Cumulative Energy Availability Factor:** 68.2%  
**Cumulative Load Factor:** 69.0%  
**Cumulative Unit Capability Factor:** 68.3%  
**Cumulative Energy Unavailability Factor:** 31.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	1059.8	780.0	94.0	94.0	94.0	94.0	92.8	92.8	1376	94.0
1975	4980.4	780.0	72.8	75.9	72.8	75.9	72.9	75.7	6938	79.2
1976	3170.1	780.0	46.2	62.1	46.2	62.1	46.3	62.1	4900	55.8
1977	383.8	780.0	5.6	44.3	5.6	44.3	5.6	44.3	569	6.5
1978	2762.5	780.0	40.4	43.4	40.4	43.4	40.4	43.4	4088	46.7
1979	1648.9	780.0	24.1	39.7	24.1	39.7	24.1	39.6	2269	25.9
1980	2705.1	780.0	39.4	39.6	39.4	39.6	39.5	39.6	3604	41.0
1981	3990.2	780.0	58.3	42.2	58.3	42.2	58.4	42.2	5180	59.1
1982	3872.1	780.0	56.5	44.0	56.5	44.0	56.7	44.0	5085	58.0
1983	5716.2	780.0	83.7	48.3	83.7	48.3	83.7	48.3	7403	84.5
1984	3537.4	780.0	51.4	48.6	51.4	48.6	51.6	48.7	4586	52.2
1985	5000.8	780.0	72.8	50.8	72.8	50.8	73.2	50.8	6473	73.9
1986	5070.3	780.0	73.9	52.7	73.9	52.7	74.2	52.8	6507	74.3
1987	4701.4	780.0	70.2	54.0	70.2	54.0	68.8	54.0	6148	70.2
1988	4147.1	780.0	60.9	54.5	60.9	54.5	60.5	54.4	5351	60.9
1989	4877.3	780.0	72.0	55.6	72.0	55.6	71.4	55.6	6311	72.0
1990	6265.5	780.0	90.8	57.8	90.8	57.8	91.7	57.8	8002	91.3
1991	4795.0	780.0	68.2	58.4	68.2	58.4	70.2	58.5	6202	70.8
1992	4645.0	780.0	67.6	58.9	67.6	58.9	67.8	59.0	6051	68.9
1993	3299.7	780.0	48.4	58.4	48.4	58.4	48.3	58.5	4458	50.9
1994	4024.0	780.0	58.8	58.4	58.8	58.4	58.9	58.5	5146	58.7
1995	6585.1	780.0	96.0	60.2	96.0	60.2	96.4	60.3	8485	96.9
1996	3358.8	780.0	48.8	59.7	48.8	59.7	49.0	59.8	4331	49.3
1997	4674.4	780.0	68.1	60.0	68.1	60.0	68.4	60.1	6000	68.5
1998	6856.8	780.0	100.0	61.7	100.0	61.7	100.4	61.8	8760	100.0
1999	5704.2	780.0	84.3	62.6	83.2	62.5	83.5	62.7	7291	83.2
2000	6008.1	780.0	87.4	63.5	87.4	63.5	87.7	63.6	7716	87.8
2001	6005.8	780.0	87.6	64.4	87.6	64.4	87.9	64.5	7731	88.3
2002	6056.3	780.0	88.4	65.3	88.4	65.2	88.6	65.4	7749	88.5
2003	6247.2	780.0	87.2	66.0	87.2	66.0	91.4	66.3	7637	87.2
2004	5539.9	780.0	77.2	66.4	77.2	66.4	80.9	66.8	6785	77.2
2005	6222.5	780.0	87.1	67.1	87.1	67.0	91.1	67.5	7659	87.4
2006	6347.1	780.0	89.2	67.7	89.2	67.7	92.9	68.3	7811	89.2
2007	6012.9	780.0	84.2	68.2	84.2	68.2	88.0	68.9	7399	84.5
2008	4935.8	780.0	68.8	68.3	68.8	68.2	72.2	69.0	6077	69.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		262			384	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	2453			1944		
D. Inspection, maintenance or repair without refuelling				203		
E. Testing of plant systems or component				0		
J. Grid limitation, failure or grid unavailability						2
Z. Others					9	
Subtotal	2453	262	0	2147	394	2
Total		2715			2543	

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	262	
12. Reactor I&C Systems		7
15. Reactor Cooling System:		100
16. Steam generation system:		234
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System		25
42. Electrical Power Supply System:		0
Total	262	382

## 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 4042.5 GW(e).h  
**Energy Availability Factor:** 55.9%  
**Load Factor:** 59.2%  
**Operating Factor:** 56.5%  
**Energy Unavailability Factor:** 44.1%  
**Total Off-line Time:** 3811 hours

### 3. 2008 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	417.8	608.3	603.2	588.7	613.5	595.6	615.3	4042.5
<b>EAF (%)</b>	0.0	-3.6	0.0	-0.1	0.0	70.6	100.0	100.0	100.0	100.0	100.0	100.0	55.9
<b>UCF (%)</b>	0.0	-3.6	0.0	-0.1	0.0	70.6	100.0	100.0	100.0	100.0	100.0	100.0	55.9
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	74.4	104.8	103.9	104.8	105.6	106.1	106.0	59.2
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	74.0	100.0	100.0	100.0	99.9	100.0	100.0	56.5
<b>EUF (%)</b>	100.0	103.6	100.0	100.1	100.0	29.4	0.0	0.0	0.0	0.0	0.0	0.0	44.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.3
<b>UCLF (%)</b>	100.0	103.6	100.0	100.1	100.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0	43.8
<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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2007/8/17-2008/6/11)

## 5. Historical Summary

<b>Date of Construction Start:</b>	09 Mar 1971	<b>Lifetime Generation:</b>	155500.0 GW(e).h
<b>Date of First Criticality:</b>	20 Dec 1974	<b>Cumulative Energy Availability Factor:</b>	67.6%
<b>Date of Grid Connection:</b>	17 Jan 1975	<b>Cumulative Load Factor:</b>	68.6%
<b>Date of Commercial Operation:</b>	14 Nov 1975	<b>Cumulative Unit Capability Factor:</b>	67.7%
		<b>Cumulative Energy Unavailability Factor:</b>	32.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	1147.0	780.0	99.5	99.5	99.5	99.5	100.4	100.4	1464	100.0
1976	3728.8	780.0	54.2	60.7	54.2	60.7	54.4	61.0	6214	70.7
1977	4742.0	780.0	69.4	64.7	69.4	64.7	69.4	64.9	6429	73.4
1978	4170.3	780.0	61.0	63.5	61.0	63.5	61.0	63.7	5751	65.7
1979	1281.0	780.0	18.7	52.8	18.7	52.8	18.7	52.9	1826	20.8
1980	5751.1	780.0	83.7	58.8	83.7	58.8	83.9	58.9	7450	84.8
1981	4763.2	780.0	69.6	60.5	69.6	60.5	69.7	60.7	6198	70.8
1982	4133.9	780.0	60.3	60.5	60.3	60.5	60.5	60.6	5407	61.7
1983	3549.4	780.0	51.7	59.4	51.7	59.4	51.9	59.6	4645	53.0
1984	4503.1	780.0	65.4	60.1	65.4	60.1	65.7	60.2	5746	65.4
1985	4967.4	780.0	72.4	61.3	72.4	61.3	72.7	61.5	6466	73.8
1986	3997.8	780.0	58.4	61.0	58.4	61.0	58.5	61.2	5183	59.2
1987	4621.8	780.0	70.3	61.8	67.3	61.5	67.6	61.7	6154	70.3
1988	3071.3	780.0	45.5	60.5	45.5	60.3	44.8	60.4	4001	45.5
1989	3991.5	780.0	59.5	60.5	59.5	60.3	58.4	60.3	5213	59.5
1990	1727.9	780.0	20.8	57.9	20.8	57.7	25.3	58.0	2218	25.3
1991	2265.8	780.0	32.2	56.3	32.2	56.1	33.2	56.5	3054	34.9
1992	4873.8	780.0	70.8	57.1	70.8	57.0	71.1	57.3	6226	70.9
1993	5757.0	780.0	84.0	58.6	84.0	58.4	84.3	58.8	7426	84.8
1994	3357.3	780.0	49.3	58.1	49.3	58.0	49.1	58.3	4299	49.1
1995	4458.7	780.0	65.1	58.5	65.1	58.3	65.3	58.6	5906	67.4
1996	6709.1	780.0	97.7	60.3	97.3	60.2	97.9	60.5	8629	98.2
1997	4981.2	780.0	72.5	60.9	72.5	60.7	72.9	61.1	6306	72.0
1998	5972.9	780.0	87.0	62.0	87.0	61.9	87.4	62.2	7657	87.4
1999	5989.8	780.0	87.2	63.0	87.2	62.9	87.7	63.2	7717	88.1
2000	6849.9	780.0	99.5	64.5	99.5	64.4	100.0	64.7	8784	100.0
2001	5901.0	780.0	86.0	65.3	86.0	65.2	86.4	65.5	7572	86.4
2002	6097.7	780.0	87.0	66.1	87.0	66.0	89.2	66.4	7626	87.1
2003	5470.8	780.0	76.4	66.5	76.4	66.4	80.1	66.9	6717	76.7
2004	6346.6	780.0	89.3	67.3	88.9	67.1	92.6	67.8	7839	89.2
2005	6249.5	780.0	86.7	67.9	86.7	67.8	91.5	68.6	7625	87.0
2006	5653.4	780.0	78.3	68.2	78.3	68.1	82.7	69.0	6890	78.7
2007	4521.8	780.0	62.5	68.1	62.5	67.9	66.2	68.9	5483	62.6
2008	4042.5	780.0	55.9	67.7	55.9	67.6	59.2	68.6	4949	56.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		3835			193	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	2365					
D. Inspection, maintenance or repair without refuelling	10					
Z. Others					17	
Subtotal	0	3835	0	2375	215	0
Total		3835			2590	

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	3835	100
16. Steam generation system:		80
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		8
42. Electrical Power Supply System:		1
Total	3835	191

# 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3102.6 GW(e).h  
**Energy Availability Factor:** 40.5%  
**Load Factor:** 42.7%  
**Operating Factor:** 41.2%  
**Energy Unavailability Factor:** 59.5%  
**Total Off-line Time:** 5152 hours

## 3. 2008 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	552.7	624.8	648.1	628.6	648.5	3102.6
EAF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	86.4	100.0	100.0	100.0	100.0	40.5
UCF (%)	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	86.4	100.0	100.0	100.0	100.0	40.5
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.5	104.5	104.8	105.2	105.0	42.7
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	91.4	100.0	99.9	100.0	100.0	41.2
EUAF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	13.6	0.0	0.0	0.0	0.0	59.5
PUF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	13.6	0.0	0.0	0.0	0.0	59.5
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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2007/11/23-2008/8/6)

## 5. Historical Summary

**Date of Construction Start:** 12 Dec 1980  
**Date of First Criticality:** 17 Apr 1984  
**Date of Grid Connection:** 09 May 1984  
**Date of Commercial Operation:** 17 Jan 1985

**Lifetime Generation:** 145858.0 GW(e).h  
**Cumulative Energy Availability Factor:** 82.0%  
**Cumulative Load Factor:** 83.7%  
**Cumulative Unit Capability Factor:** 82.0%  
**Cumulative Energy Unavailability Factor:** 18.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	6199.5	830.0	84.7	84.7	84.7	84.7	85.3	85.3	7426	84.8
1986	6833.6	830.0	93.1	88.9	93.1	88.9	94.0	89.6	8215	93.8
1987	6030.4	830.0	82.9	86.9	82.9	86.9	82.9	87.4	7265	82.9
1988	5743.2	830.0	79.1	85.0	79.1	85.0	78.8	85.2	6948	79.1
1989	5987.2	830.0	81.5	84.3	81.5	84.3	82.3	84.7	7138	81.5
1990	6775.0	830.0	91.9	85.5	91.9	85.5	93.2	86.1	8143	93.0
1991	5513.6	830.0	73.9	83.9	73.9	83.9	75.8	84.6	6641	75.8
1992	6059.9	830.0	82.2	83.7	82.2	83.7	83.1	84.4	7292	83.0
1993	5804.8	830.0	77.6	83.0	77.6	83.0	79.8	83.9	6983	79.7
1994	7361.1	830.0	100.0	84.7	100.0	84.7	101.2	85.6	8760	100.0
1995	5662.9	830.0	77.0	84.0	77.0	84.0	77.9	84.9	6809	77.7
1996	5479.3	830.0	74.2	83.2	74.2	83.2	75.2	84.1	6576	74.9
1997	6028.9	830.0	81.9	83.1	81.9	83.1	82.9	84.0	7206	82.3
1998	6853.7	830.0	93.1	83.8	93.1	83.8	94.3	84.8	8161	93.2
1999	6833.4	830.0	93.9	84.5	92.8	84.4	94.0	85.4	8131	92.8
2000	5898.9	830.0	79.9	84.2	79.9	84.1	80.9	85.1	7023	80.0
2001	6167.2	830.0	83.8	84.2	83.8	84.1	84.8	85.1	7340	83.8
2002	6463.3	830.0	87.3	84.3	87.3	84.3	88.9	85.3	7654	87.4
2003	7355.7	830.0	96.1	84.9	96.1	84.9	101.2	86.1	8421	96.1
2004	5625.1	830.0	74.1	84.4	74.1	84.4	77.2	85.7	6512	74.1
2005	5738.4	830.0	75.6	84.0	75.6	83.9	78.9	85.4	6656	76.0
2006	5702.9	830.0	75.0	83.6	75.0	83.5	78.4	85.0	6604	75.4
2007	6847.4	830.0	89.4	83.8	89.4	83.8	94.2	85.4	7834	89.4
2008	3102.6	830.0	40.5	82.0	40.5	82.0	42.7	83.7	3608	41.2



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure	5176			1279	4	3
C. Inspection, maintenance or repair combined with refuelling						
H. Nuclear regulatory requirement					16	
J. Grid limitation, failure or grid unavailability						
Z. Others					42	
Subtotal	5176	0	0	1279	62	3
Total	5176			1344		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		1
13. Reactor Auxiliary System:		3
32. Feedwater and Main Steam System		0
Total	0	4

# 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 5009.8 GW(e).h  
**Energy Availability Factor:** 65.5%  
**Load Factor:** 68.9%  
**Operating Factor:** 66.5%  
**Energy Unavailability Factor:** 34.5%  
**Total Off-line Time:** 2935 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	650.3	607.8	649.7	628.6	649.2	627.2	643.4	459.9	0.0	0.0	0.0	93.5	5009.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.8	0.0	0.1	0.0	15.3	65.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.8	0.0	0.1	0.0	15.3	65.5
<b>LF (%)</b>	105.3	109.0	105.2	105.3	105.1	105.0	104.2	74.5	0.0	0.0	0.0	15.1	68.9
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	72.3	0.0	0.0	0.0	23.5	66.5
<b>EUAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.2	100.0	99.9	100.0	84.7	34.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.2	100.0	99.9	100.0	84.7	34.5
<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. 2008 Summary of Operation

PERIODICAL INSPECTION AND REFUELING.(2008/8/23-)

## 5. Historical Summary

**Date of Construction Start:** 19 Mar 1981 **Lifetime Generation:** 146152.0 GW(e).h  
**Date of First Criticality:** 11 Oct 1984 **Cumulative Energy Availability Factor:** 83.4%  
**Date of Grid Connection:** 01 Nov 1984 **Cumulative Load Factor:** 85.2%  
**Date of Commercial Operation:** 05 Jun 1985 **Cumulative Unit Capability Factor:** 83.5%  
**Cumulative Energy Unavailability Factor:** 16.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	4314.3	830.0	100.0	100.0	100.0	100.0	101.2	101.2	5136	100.0
1986	5864.0	830.0	79.6	87.1	79.6	87.1	80.7	88.2	7073	80.7
1987	5588.5	830.0	77.0	83.2	77.0	83.2	76.9	83.8	6743	77.0
1988	6437.9	830.0	87.3	84.3	87.3	84.3	88.3	85.1	7666	87.3
1989	6802.7	830.0	93.2	86.3	93.2	86.3	93.6	86.9	8167	93.2
1990	5174.6	830.0	69.0	83.2	69.0	83.2	71.2	84.1	6233	71.2
1991	6170.1	830.0	83.1	83.2	83.1	83.2	84.9	84.2	7409	84.6
1992	6048.4	830.0	81.9	83.0	81.9	83.0	83.0	84.1	7265	82.7
1993	7210.9	830.0	97.9	84.7	97.9	84.7	99.2	85.8	8578	97.9
1994	5767.2	830.0	78.5	84.1	78.5	84.1	79.3	85.1	6861	78.3
1995	5651.8	830.0	76.7	83.4	76.7	83.4	77.7	84.4	6785	77.5
1996	5666.5	830.0	76.7	82.8	76.7	82.8	77.7	83.9	6785	77.2
1997	7367.3	830.0	100.0	84.2	100.0	84.2	101.3	85.2	8760	100.0
1998	6470.2	830.0	87.8	84.4	87.8	84.4	89.0	85.5	7727	88.2
1999	5500.3	830.0	75.8	83.8	74.6	83.8	75.6	84.8	6542	74.7
2000	6099.0	830.0	82.6	83.8	82.6	83.7	83.7	84.8	7254	82.6
2001	7364.6	830.0	100.0	84.7	100.0	84.7	101.3	85.8	8760	100.0
2002	6145.5	830.0	83.5	84.7	83.5	84.6	84.5	85.7	7316	83.5
2003	6490.2	830.0	86.0	84.7	86.0	84.7	89.3	85.9	7531	86.0
2004	5987.8	830.0	78.2	84.4	78.2	84.3	82.1	85.7	6868	78.2
2005	6633.2	830.0	87.4	84.5	87.4	84.5	91.2	86.0	7657	87.4
2006	6589.8	830.0	86.6	84.6	86.6	84.6	90.6	86.2	7612	86.9
2007	5787.6	830.0	76.0	84.3	76.0	84.2	79.6	85.9	6688	76.3
2008	5009.8	830.0	65.5	83.5	65.5	83.4	68.9	85.2	5825	66.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					11	
C. Inspection, maintenance or repair combined with refuelling	2959			1267		
J. Grid limitation, failure or grid unavailability						4
Z. Others					13	
Subtotal	2959	0	0	1267	24	4
Total	2959			1295		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		11
Total	0	11

## JP-21 TOKAI-2

**Operator:** JAPCO (JAPAN ATOMIC POWER CO.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1060.0 MW(e)  
**Design Net Capacity:** 1056.0 MW(e)  
**Design Discharge Burnup:** 39500 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 6545.9 GW(e).h  
**Energy Availability Factor:** 68.7%  
**Load Factor:** 70.5%  
**Operating Factor:** 70.0%  
**Energy Unavailability Factor:** 31.3%  
**Total Off-line Time:** 2628 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	799.6	748.1	434.4	0.0	0.0	0.0	566.4	808.7	782.2	810.5	785.0	811.1	6545.9
<b>EAF (%)</b>	100.0	100.0	54.3	-0.1	0.0	0.0	70.4	100.0	100.0	100.0	100.0	100.0	68.7
<b>UCF (%)</b>	100.0	100.0	54.3	-0.1	0.0	0.0	70.4	100.0	100.0	100.0	100.0	100.0	68.7
<b>LF (%)</b>	101.4	105.0	55.1	0.0	0.0	0.0	71.8	102.5	102.5	102.6	102.9	102.8	70.5
<b>OF (%)</b>	100.0	103.6	55.6	0.0	0.0	0.0	81.5	100.0	100.0	99.9	100.0	100.0	70.0
<b>EUF (%)</b>	0.0	0.0	45.7	100.1	100.0	100.0	29.6	0.0	0.0	0.0	0.0	0.0	31.3
<b>PUF (%)</b>	0.0	0.0	45.7	100.1	100.0	100.0	29.6	0.0	0.0	0.0	0.0	0.0	31.3
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	03 Oct 1973	<b>Lifetime Generation:</b>	209067.0 GW(e).h
<b>Date of First Criticality:</b>	18 Jan 1978	<b>Cumulative Energy Availability Factor:</b>	73.8%
<b>Date of Grid Connection:</b>	13 Mar 1978	<b>Cumulative Load Factor:</b>	73.5%
<b>Date of Commercial Operation:</b>	28 Nov 1978	<b>Cumulative Unit Capability Factor:</b>	73.9%
		<b>Cumulative Energy Unavailability Factor:</b>	26.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	0.0	1056.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1979	5209.5	1056.0	56.3	62.6	56.3	62.6	56.3	48.3	5481	62.6
1980	6743.2	1056.0	72.6	67.2	72.6	67.2	72.7	59.5	6597	75.1
1981	6059.1	1056.0	65.3	66.6	65.3	66.6	65.5	61.4	6037	68.9
1982	5571.6	1056.0	59.6	64.9	59.6	64.9	60.2	61.1	5338	60.9
1983	6556.6	1056.0	70.5	66.0	70.5	66.0	70.9	63.0	6327	72.2
1984	8695.2	1056.0	93.5	70.5	93.5	70.5	93.7	68.0	8240	93.8
1985	6957.5	1056.0	75.0	71.1	75.0	71.1	75.2	69.0	6625	75.6
1986	5797.6	1056.0	62.5	70.0	62.5	70.0	62.7	68.2	5508	62.9
1987	7040.5	1056.0	76.5	70.7	76.5	70.7	76.1	69.1	6776	77.4
1988	6088.4	1056.0	66.0	70.3	66.0	70.3	65.6	68.8	5872	66.8
1989	8435.0	1056.0	91.2	72.1	91.2	72.1	91.2	70.8	8006	91.4
1990	7291.6	1056.0	78.9	72.7	78.9	72.7	78.8	71.4	6948	79.3
1991	7025.3	1056.0	76.1	73.0	76.1	73.0	75.9	71.8	6716	76.7
1992	6307.7	1080.0	68.6	72.6	68.5	72.6	66.5	71.4	5990	68.2
1993	8707.2	1080.0	93.8	74.1	93.8	74.1	92.0	72.8	8252	94.2
1994	7325.8	1056.0	78.9	74.4	78.9	74.4	79.2	73.2	6938	79.2
1995	6845.0	1056.0	73.7	74.3	73.7	74.3	74.0	73.2	6488	74.1
1996	7562.1	1056.0	80.8	74.7	80.7	74.7	81.5	73.7	7169	81.6
1997	8884.5	1056.0	95.7	75.8	95.6	75.8	96.0	74.8	8404	95.9
1998	6999.4	1056.0	75.1	75.7	75.0	75.7	75.7	74.9	6642	75.8
1999	2316.1	1056.0	25.4	73.4	24.9	73.3	25.0	72.5	2228	25.4
2000	7031.6	1056.0	76.3	73.5	75.4	73.4	75.8	72.7	6626	75.4
2001	5833.2	1056.0	62.7	73.0	62.7	73.0	63.1	72.3	5641	64.4
2002	6420.1	1056.0	70.0	72.9	68.9	72.8	69.4	72.1	6061	69.2
2003	9176.5	1056.0	98.6	73.9	98.5	73.8	99.2	73.2	8635	98.6
2004	7195.4	1060.0	76.5	74.0	76.3	73.9	77.3	73.4	6723	76.5
2005	5259.5	1060.0	55.8	73.4	55.8	73.2	56.6	72.8	4914	56.1
2006	8186.9	1060.0	87.9	73.9	87.3	73.7	88.2	73.3	7704	87.9
2007	7518.8	1060.0	80.0	74.1	80.0	74.0	81.0	73.6	7048	80.5
2008	6545.9	1060.0	68.7	73.9	68.7	73.8	70.5	73.5	6132	70.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1979 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					343	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	2725			1690		
D. Inspection, maintenance or repair without refuelling				32		
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					21	
Subtotal	2725	0	0	1722	364	4
Total	2725			2090		

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

System	2008 Hours Lost	1979 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		198
13. Reactor Auxiliary System:		5
14. Safety Systems		30
15. Reactor Cooling System:		40
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		43
42. Electrical Power Supply System:		11
Total	0	340

**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 at the beginning of 2008:** 550.0 MW(e)

**Design Net Capacity:** 550.0 MW(e)

**Design Discharge Burnup:** 31500 MW.d/t

**Status at end of year:** Operational

**2. Production Summary 2008**

**Net Energy Production:** 3111.1 GW(e).h

**Energy Availability Factor:** 63.0%

**Load Factor:** 64.6%

**Operating Factor:** 63.7%

**Energy Unavailability Factor:** 37.0%

**Total Off-line Time:** 3182 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	418.4	391.3	418.3	405.0	418.7	404.6	415.2	50.7	0.0	0.0	0.0	189.0	3111.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.3	0.0	0.1	0.0	45.6	63.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.3	0.0	0.1	0.0	45.6	63.0
<b>LF (%)</b>	102.2	105.9	102.2	102.4	102.3	102.2	101.5	12.4	0.0	0.0	0.0	46.2	64.6
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	12.8	0.0	0.0	0.0	49.9	63.7
<b>EUAF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.7	100.0	99.9	100.0	54.4	37.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.7	100.0	99.9	100.0	54.4	37.0
<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. 2008 Summary of Operation**

PERIODICAL INSPECTION AND REFUELING.(2008/8/4-2008/12/16)

**5. Historical Summary**

**Date of Construction Start:** 18 Apr 1985      **Lifetime Generation:** 80551.0 GW(e).h

**Date of First Criticality:** 16 Nov 1988      **Cumulative Energy Availability Factor:** 84.2%

**Date of Grid Connection:** 06 Dec 1988      **Cumulative Load Factor:** 84.9%

**Date of Commercial Operation:** 22 Jun 1989      **Cumulative Unit Capability Factor:** 84.2%

**Cumulative Energy Unavailability Factor:** 15.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	2802.8	550.0	99.6	99.6	99.6	99.6	99.2	99.2	5136	100.0
1990	3830.7	550.0	79.5	86.9	79.5	86.9	79.5	86.8	7092	81.0
1991	3540.4	550.0	73.5	81.7	73.5	81.7	73.5	81.6	6588	75.2
1992	3646.4	550.0	75.9	80.1	75.9	80.1	75.5	79.9	6780	77.2
1993	4795.2	550.0	100.0	84.4	100.0	84.4	99.5	84.2	8760	100.0
1994	3903.9	550.0	81.4	83.9	81.4	83.9	81.0	83.6	7208	82.3
1995	3946.3	550.0	81.9	83.6	81.9	83.6	81.9	83.4	7175	81.9
1996	3750.4	550.0	78.1	82.8	78.1	82.8	77.6	82.6	6920	78.8
1997	4795.6	550.0	100.0	84.8	100.0	84.8	99.5	84.6	8760	100.0
1998	4239.1	550.0	83.1	84.7	83.1	84.7	88.0	84.9	7373	84.2
1999	4074.6	550.0	79.7	84.2	79.7	84.2	84.6	84.9	6986	79.7
2000	4168.5	550.0	86.5	84.4	86.5	84.4	86.3	85.0	7598	86.5
2001	4804.0	550.0	100.0	85.6	100.0	85.6	99.7	86.2	8760	100.0
2002	4177.3	550.0	86.9	85.7	86.9	85.7	86.7	86.2	7614	86.9
2003	3821.7	550.0	78.7	85.2	78.7	85.2	79.3	85.8	6893	78.7
2004	3788.8	550.0	77.0	84.7	77.0	84.7	78.4	85.3	6762	77.0
2005	4818.8	550.0	98.3	85.5	98.3	85.5	100.0	86.2	8616	98.4
2006	4236.7	550.0	86.9	85.6	86.9	85.6	87.9	86.3	7643	87.2
2007	3952.5	550.0	80.6	85.3	80.6	85.3	82.0	86.0	7121	81.3
2008	3111.1	550.0	63.0	84.2	63.0	84.2	64.6	84.9	5578	63.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1990 to 2008 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	3206			1149		
Z. Others					28	
Subtotal	3206	0	0	1149	67	0
Total	3206			1216		

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

System	2008 Hours Lost	1990 to 2008 Average Hours Lost Per Year
32. Feedwater and Main Steam System		25
42. Electrical Power Supply System:		13
Total	0	38



**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  
 at the beginning of 2008: 550.0 MW(e)  
 Design Net Capacity: 550.0 MW(e)  
 Design Discharge Burnup: 31500 MW.d/t  
 Status at end of year: Operational

**2. Production Summary 2008**

Net Energy Production: 3018.3 GW(e).h  
 Energy Availability Factor: 61.4%  
 Load Factor: 62.5%  
 Operating Factor: 61.6%  
 Energy Unavailability Factor: 38.6%  
 Total Off-line Time: 3373 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	418.2	391.2	159.6	0.0	0.0	0.0	0.8	402.2	403.0	417.9	405.7	419.8	3018.3
EAF (%)	100.0	100.0	38.2	0.0	0.0	0.0	0.2	100.0	100.0	100.0	100.0	100.0	61.4
UCF (%)	100.0	100.0	38.2	0.0	0.0	0.0	0.2	100.0	100.0	100.0	100.0	100.0	61.4
LF (%)	102.2	102.2	39.0	0.0	0.0	0.0	0.2	98.3	101.8	102.1	102.4	102.6	62.5
OF (%)	100.0	100.0	38.7	0.0	0.0	0.0	1.5	100.0	100.0	100.0	100.0	100.0	61.6
EUF (%)	0.0	0.0	61.8	100.0	100.0	100.0	99.8	0.0	0.0	0.0	0.0	0.0	38.6
PUF (%)	0.0	0.0	61.8	100.0	100.0	100.0	99.8	0.0	0.0	0.0	0.0	0.0	38.6
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. 2008 Summary of Operation**

PERIODICAL INSPECTION AND REFUELING.(2008/3/13-2008/7/31)

**5. Historical Summary**

Date of Construction Start: 13 Jun 1985      Lifetime Generation: 72900.0 GW(e).h  
 Date of First Criticality: 25 Jul 1990      Cumulative Energy Availability Factor: 83.2%  
 Date of Grid Connection: 27 Aug 1990      Cumulative Load Factor: 84.4%  
 Date of Commercial Operation: 12 Apr 1991      Cumulative Unit Capability Factor: 83.2%  
    Cumulative Energy Unavailability Factor: 16.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1991	2759.6	550.0	76.0	76.0	76.0	76.0	76.0	76.0	5076	76.9
1992	3639.6	550.0	75.5	75.7	75.5	75.7	75.3	75.6	6756	76.9
1993	3847.5	550.0	80.0	77.3	80.0	77.3	79.9	77.2	7092	81.0
1994	4511.6	550.0	93.9	81.7	93.9	81.7	93.6	81.6	8232	94.0
1995	4161.9	550.0	85.5	82.5	85.5	82.5	86.4	82.6	7567	86.4
1996	3933.6	550.0	81.5	82.3	81.5	82.3	81.4	82.4	7232	82.3
1997	3775.2	550.0	78.5	81.8	78.5	81.8	78.4	81.8	6943	79.3
1998	5071.6	550.0	100.0	84.1	100.0	84.1	105.3	84.8	8760	100.0
1999	4273.2	550.0	83.8	84.1	83.8	84.1	88.7	85.2	7344	83.8
2000	4107.5	550.0	85.1	84.2	85.1	84.2	85.0	85.2	7477	85.1
2001	3971.3	550.0	82.6	84.0	82.6	84.0	82.4	85.0	7235	82.6
2002	4516.1	550.0	93.9	84.9	93.9	84.9	93.7	85.7	8228	93.9
2003	3542.0	550.0	71.9	83.9	71.9	83.9	73.5	84.8	6300	71.9
2004	3864.7	550.0	78.1	83.4	78.1	83.4	80.0	84.4	6862	78.1
2005	4252.6	550.0	86.0	83.6	86.0	83.6	88.3	84.7	7571	86.4
2006	4316.9	550.0	87.9	83.9	87.9	83.9	89.6	85.0	7704	87.9
2007	4663.2	550.0	94.8	84.5	94.8	84.5	96.8	85.7	8339	95.2
2008	3018.3	550.0	61.4	83.2	61.4	83.2	62.5	84.4	5411	61.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1991 to 2008 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	3373			1054		
D. Inspection, maintenance or repair without refuelling				84		
Subtotal	3373	0	0	1138	95	0
Total	3373			1233		

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

System	2008 Hours Lost	1991 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		95
Total	0	95

# JP-3 TSURUGA-1

**Operator:** JAPCO (JAPAN ATOMIC POWER CO.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2276.6 GW(e).h  
**Energy Availability Factor:** 72.7%  
**Load Factor:** 76.2%  
**Operating Factor:** 76.2%  
**Energy Unavailability Factor:** 27.3%  
**Total Off-line Time:** 2088 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	253.0	236.6	253.0	244.8	115.6	241.7	132.3	253.0	244.8	253.0	49.0	0.0	2276.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	45.4	96.8	48.5	97.7	73.8	96.6	14.6	0.0	72.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	45.4	96.9	48.8	99.1	74.1	100.0	16.3	0.0	73.3
<b>LF (%)</b>	100.0	100.0	100.0	100.0	45.7	98.8	52.3	100.0	100.0	100.0	20.0	0.0	76.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	45.7	98.8	52.3	100.0	100.0	100.0	20.0	0.0	76.2
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	54.6	3.2	51.5	2.3	26.2	3.4	85.4	100.0	27.3
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	83.7	100.0	15.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	54.6	3.1	51.2	0.3	25.9	0.0	0.0	0.0	11.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1.3	0.3	3.4	1.7	0.0	0.6

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 24 Nov 1966  
**Date of First Criticality:** 03 Oct 1969  
**Date of Grid Connection:** 16 Nov 1969  
**Date of Commercial Operation:** 14 Mar 1970

**Lifetime Generation:** 77201.0 GW(e).h  
**Cumulative Energy Availability Factor:** 68.2%  
**Cumulative Load Factor:** 67.7%  
**Cumulative Unit Capability Factor:** 68.4%  
**Cumulative Energy Unavailability Factor:** 31.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1970	1797.0	357.0	68.5	68.5	68.5	68.5	68.5	68.5	5680	77.3
1971	2122.2	357.0	72.1	70.5	72.1	70.5	67.9	68.2	6312	72.1
1972	2272.2	357.0	76.0	72.4	76.0	72.4	72.5	69.7	7031	80.0
1973	2396.8	342.0	80.0	74.3	80.0	74.3	80.0	72.3	7485	85.4
1974	1819.1	320.0	64.9	72.5	64.9	72.5	64.9	70.9	6009	68.6
1975	1004.4	321.0	35.6	66.6	35.6	66.6	35.7	65.2	3301	37.7
1976	2036.3	340.0	68.4	66.9	68.4	66.9	68.2	65.7	6676	76.0
1977	1084.0	340.0	36.4	63.0	36.4	63.0	36.4	61.9	3548	40.5
1978	2039.8	340.0	68.5	63.6	68.5	63.6	68.5	62.7	6565	74.9
1979	1818.9	321.0	64.7	63.7	64.7	63.7	64.7	62.9	5873	67.0
1980	2063.1	321.0	73.1	64.5	73.1	64.5	73.2	63.8	6669	75.9
1981	663.4	340.0	27.1	61.4	27.1	61.4	22.3	60.2	2139	24.4
1982	1614.0	340.0	59.5	61.2	59.5	61.2	54.2	59.8	5245	59.9
1983	1972.1	340.0	69.8	61.8	69.8	61.8	66.2	60.2	6464	73.8
1984	2643.1	325.0	92.1	63.8	92.1	63.8	92.4	62.3	8129	92.5
1985	1703.6	340.0	57.3	63.4	57.3	63.4	57.2	62.0	5088	58.1
1986	2286.3	340.0	77.5	64.2	77.1	64.2	76.8	62.9	6863	78.3
1987	2349.2	340.0	80.2	65.1	80.2	65.1	78.9	63.8	7052	80.5
1988	2222.9	341.0	74.8	65.7	74.8	65.6	74.2	64.4	6611	75.3
1989	2457.7	341.0	82.8	66.5	82.8	66.5	82.3	65.3	7298	83.3
1990	1959.8	341.0	65.6	66.5	65.6	66.5	65.6	65.3	5822	66.5
1991	2255.9	341.0	76.6	67.0	76.1	66.9	75.5	65.8	6742	77.0
1992	1994.1	341.0	66.9	67.0	66.7	66.9	66.6	65.8	5914	67.3
1993	2623.7	341.0	87.5	67.8	87.5	67.8	87.8	66.7	7745	88.4
1994	1507.5	341.0	50.5	67.1	50.5	67.1	50.5	66.1	4477	51.1
1995	2328.7	341.0	79.7	67.6	77.3	67.5	78.0	66.5	7027	80.2
1996	2514.2	341.0	84.0	68.2	84.0	68.1	83.9	67.2	7411	84.4
1997	1936.1	341.0	64.8	68.1	64.8	68.0	64.8	67.1	5728	65.4
1998	1870.5	341.0	62.7	67.9	62.7	67.8	62.6	66.9	5528	63.1
1999	1845.0	341.0	63.2	67.8	62.5	67.6	61.8	66.8	5542	63.3
2000	0.0	341.0	0.0	65.5	0.0	65.4	0.0	64.6	0	0.0
2001	2584.5	341.0	86.6	66.2	86.6	66.1	86.5	65.3	7594	86.7
2002	2546.6	341.0	85.5	66.8	85.3	66.7	85.3	65.9	7495	85.6
2003	2426.3	341.0	81.0	67.2	80.7	67.1	81.2	66.3	7135	81.4
2004	2535.9	341.0	84.2	67.7	84.1	67.6	84.7	66.9	7395	84.2
2005	2547.6	341.0	85.0	68.2	85.0	68.1	85.3	67.4	7568	86.4
2006	2845.0	340.0	95.1	68.9	95.0	68.8	95.5	68.2	8558	97.7
2007	1267.1	340.0	42.6	68.2	42.5	68.1	42.5	67.5	3757	42.9
2008	2276.6	340.0	73.3	68.4	72.7	68.2	76.2	67.7	6696	76.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		826			338	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1324			2137	19	
D. Inspection, maintenance or repair without refuelling				94		
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					10	
Subtotal	1324	826	0	2231	367	2
Total		2150			2600	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		69
12. Reactor I&C Systems		99
14. Safety Systems		21
15. Reactor Cooling System:	826	103
31. Turbine and auxiliaries		23
32. Feedwater and Main Steam System		5
42. Electrical Power Supply System:		10
Total	826	330

# 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  
 at the beginning of 2008: 1110.0 MW(e)  
 Design Net Capacity: 1115.0 MW(e)  
 Design Discharge Burnup: 48000 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 992.7 GW(e).h  
 Energy Availability Factor: 10.0%  
 Load Factor: 10.2%  
 Operating Factor: 10.9%  
 Energy Unavailability Factor: 90.0%  
 Total Off-line Time: 7827 hours

## 3. 2008 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	579.6	413.1	0.0	0.0	0.0	992.7
EAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.2	50.0	0.0	0.0	0.0	10.0
UCF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.2	50.0	0.0	0.0	0.0	10.0
LF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.2	51.7	0.0	0.0	0.0	10.2
OF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.4	52.9	0.0	0.0	0.0	10.9
EUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	29.8	50.0	100.0	100.0	100.0	90.0
PUF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	29.8	0.0	0.0	0.0	0.0	60.7
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	100.0	100.0	100.0	29.2
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 06 Nov 1982  
 Date of First Criticality: 28 May 1986  
 Date of Grid Connection: 19 Jun 1986  
 Date of Commercial Operation: 17 Feb 1987

Lifetime Generation: 167487.0 GW(e).h  
 Cumulative Energy Availability Factor: 77.6%  
 Cumulative Load Factor: 77.7%  
 Cumulative Unit Capability Factor: 77.8%  
 Cumulative Energy Unavailability Factor: 22.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	8498.3	1115.0	95.4	95.4	95.4	95.4	95.1	95.1	7656	95.5
1988	7939.7	1115.0	81.3	88.0	81.3	88.0	81.1	87.8	7243	82.5
1989	7507.7	1115.0	77.0	84.2	77.0	84.2	76.9	84.0	6814	77.8
1990	7201.0	1115.0	72.9	81.3	72.9	81.3	73.7	81.4	6462	73.8
1991	9259.2	1115.0	95.1	84.1	95.1	84.1	94.8	84.1	8338	95.2
1992	8118.7	1115.0	82.5	83.9	82.5	83.9	82.9	83.9	7310	83.2
1993	7844.1	1115.0	80.2	83.3	80.2	83.3	80.3	83.4	7086	80.9
1994	7814.6	1115.0	80.2	82.9	80.2	82.9	80.0	83.0	7080	80.8
1995	9220.5	1115.0	94.5	84.2	94.5	84.2	94.4	84.2	8290	94.6
1996	8092.3	1115.0	83.0	84.1	83.0	84.1	82.6	84.1	7325	83.4
1997	6522.2	1115.0	67.0	82.5	67.0	82.5	66.8	82.5	5946	67.9
1998	8534.6	1115.0	92.0	83.3	92.0	83.3	87.4	82.9	7724	88.2
1999	5131.7	1115.0	52.7	81.0	52.7	81.0	52.5	80.6	4615	52.7
2000	8993.8	1115.0	92.1	81.8	92.1	81.8	91.8	81.4	8087	92.1
2001	8072.7	1115.0	82.9	81.8	82.9	81.8	82.6	81.5	7267	83.0
2002	8695.5	1115.0	88.4	82.2	88.4	82.2	89.0	81.9	7742	88.4
2003	8460.9	1115.0	84.7	82.4	84.7	82.4	86.6	82.2	7418	84.7
2004	9447.0	1115.0	95.2	83.1	95.2	83.1	96.5	83.0	8367	95.3
2005	7693.6	1115.0	77.6	82.8	77.6	82.8	78.8	82.8	6854	78.2
2006	6250.8	1110.0	63.3	81.8	63.3	81.8	64.3	81.9	5634	64.3
2007	6065.3	1110.0	64.9	81.0	61.2	80.9	62.4	80.9	5688	64.9
2008	992.7	1110.0	10.0	77.8	10.0	77.6	10.2	77.7	957	10.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2555			333	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	5292			1217		
P. Fire					13	
Subtotal	5292	2555	0	1217	351	0
Total		7847			1568	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		243
14. Safety Systems		27
15. Reactor Cooling System:		19
31. Turbine and auxiliaries	2555	
32. Feedwater and Main Steam System		43
Total	2555	332

## KR-1 KORI-1

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 576.0 MW(e)  
**Design Net Capacity:** 565.0 MW(e)  
**Design Discharge Burnup:** 42326 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 4604.8 GW(e).h  
**Energy Availability Factor:** 93.1%  
**Load Factor:** 91.3%  
**Operating Factor:** 92.4%  
**Energy Unavailability Factor:** 6.9%  
**Total Off-line Time:** 670 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	327.7	400.7	428.7	415.0	428.8	414.4	427.3	363.8	412.6	428.0	258.9	299.0	4604.8
<b>EAF (%)</b>	99.9	100.0	100.0	100.0	100.0	100.0	100.0	85.5	100.0	100.0	62.6	70.0	93.1
<b>UCF (%)</b>	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	62.6	70.0	94.4
<b>LF (%)</b>	76.5	103.5	100.0	100.2	100.1	99.9	99.7	84.9	99.5	99.7	62.4	69.8	91.3
<b>OF (%)</b>	82.8	103.6	100.0	100.1	100.0	100.0	100.0	87.1	100.0	99.9	63.3	72.3	92.4
<b>EUF (%)</b>	0.1	0.0	0.0	0.0	0.0	0.0	0.0	14.5	0.0	0.0	37.4	30.0	6.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.4	30.0	5.6
<b>UCLF (%)</b>	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
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5	0.0	0.0	0.0	0.0	1.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. STANDBY STATUS TO GET LICENSE RENEWAL FROM GOVERNMENT FOR LIFE EXTENSION(2007.6.9 ~ 2008.1.9)
2. RX TRIP BY LIGHTNING ON THE POWER TRANSMISSION LINE(2008.8.8 ~ 2008.8.12)
3. REFUELING AND MAINTENANCE(2008.11.20 ~ 2008.12.9)



## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Aug 1972	<b>Lifetime Generation:</b>	112069.9 GW(e).h
<b>Date of First Criticality:</b>	19 Jun 1977	<b>Cumulative Energy Availability Factor:</b>	78.2%
<b>Date of Grid Connection:</b>	26 Jun 1977	<b>Cumulative Load Factor:</b>	74.6%
<b>Date of Commercial Operation:</b>	29 Apr 1978	<b>Cumulative Unit Capability Factor:</b>	79.1%
		<b>Cumulative Energy Unavailability Factor:</b>	21.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	1721.9	555.0	47.0	47.0	47.0	47.0	47.0	47.0	4383	66.4
1979	2952.2	564.0	59.8	54.3	59.8	54.3	59.8	54.3	6558	74.9
1980	3258.4	564.0	79.7	63.6	79.7	63.6	65.8	58.5	6982	79.5
1981	2708.1	564.0	69.8	65.3	69.8	65.3	54.8	57.5	6092	69.5
1982	3559.2	556.0	73.1	66.9	73.1	66.9	73.1	60.8	6904	78.8
1983	3065.6	556.0	70.1	67.5	70.1	67.5	62.9	61.1	6142	70.1
1984	3236.3	556.0	67.3	67.4	67.3	67.4	66.3	61.9	6321	72.0
1985	3158.9	556.0	66.0	67.3	64.6	67.1	64.9	62.3	6364	72.6
1986	3279.5	556.0	72.8	67.9	72.8	67.7	67.3	62.8	6404	73.1
1987	4557.0	556.0	99.8	71.1	98.9	70.9	93.6	66.0	8653	98.8
1988	2221.0	556.0	50.6	69.2	50.6	69.0	45.5	64.1	4449	50.6
1989	2735.9	556.0	59.2	68.4	59.2	68.2	56.2	63.4	5256	60.0
1990	3500.1	556.0	74.6	68.9	74.6	68.7	71.9	64.1	6536	74.6
1991	4365.5	556.0	93.6	70.7	93.3	70.5	89.6	65.9	8172	93.3
1992	3640.3	556.0	76.9	71.1	76.9	70.9	74.5	66.5	6759	76.9
1993	3824.9	556.0	81.6	71.8	81.4	71.6	78.5	67.3	7131	81.4
1994	3223.4	564.0	66.2	71.4	65.8	71.2	65.2	67.1	5973	68.2
1995	3969.1	556.0	99.1	73.0	81.2	71.8	81.5	67.9	8704	99.4
1996	3748.4	556.0	78.6	73.3	76.6	72.0	76.7	68.4	6936	79.0
1997	3844.2	556.0	79.0	73.6	78.9	72.4	78.9	68.9	7080	80.8
1998	3783.7	556.0	78.7	73.8	78.7	72.7	77.7	69.4	6698	76.5
1999	4153.2	556.0	83.3	74.2	83.3	73.2	85.3	70.1	7418	84.7
2000	4514.3	556.0	89.2	74.9	89.2	73.9	92.4	71.1	7932	90.3
2001	4636.5	556.0	92.5	75.6	92.5	74.7	95.2	72.1	8144	93.0
2002	4147.0	556.0	84.0	76.0	84.0	75.0	85.1	72.6	8000	91.3
2003	4550.2	556.0	90.9	76.6	90.1	75.6	93.4	73.4	7978	91.1
2004	4637.7	556.0	92.0	77.1	92.0	76.2	95.0	74.2	8131	92.6
2005	4149.5	556.0	82.7	77.3	82.7	76.5	85.2	74.6	7304	83.4
2006	4527.3	573.0	89.7	77.8	89.7	76.9	90.2	75.2	7891	90.1
2007	2142.4	569.0	100.0	78.5	98.8	77.7	43.0	74.1	3738	42.7
2008	4604.8	576.0	94.4	79.1	93.1	78.2	91.3	74.6	8090	92.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				1	315	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	470			1210		
D. Inspection, maintenance or repair without refuelling				134		
E. Testing of plant systems or component				17	0	
J. Grid limitation, failure or grid unavailability						7
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						3
M. Governmental requirements or court decisions			128			154
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			96			2
Subtotal	470	0	224	1362	319	166
Total	694			1847		

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		8
15. Reactor Cooling System		26
16. Steam generation system		74
31. Turbine and auxiliaries		24
32. Feedwater and Main Steam System		43
35. All other I&C Systems		0
41. Main Generator System		102
42. Electrical Power Supply System		33
XX. Miscellaneous Systems		2
Total	0	312

## KR-2 KORI-2

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 637.0 MW(e)  
**Design Net Capacity:** 605.0 MW(e)  
**Design Discharge Burnup:** 36946 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 4933.9 GW(e).h  
**Energy Availability Factor:** 87.6%  
**Load Factor:** 88.4%  
**Operating Factor:** 88.7%  
**Energy Unavailability Factor:** 12.4%  
**Total Off-line Time:** 989 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	477.3	446.2	477.5	462.4	443.6	0.0	310.2	473.9	458.7	475.5	461.5	447.0	4933.9
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	93.0	0.1	64.2	99.9	100.0	100.0	100.0	93.7	87.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	93.0	0.1	64.2	100.0	100.0	100.0	100.0	93.7	87.6
<b>LF (%)</b>	100.7	104.2	100.8	101.0	93.6	0.0	65.5	100.0	100.0	100.2	100.6	94.3	88.4
<b>OF (%)</b>	100.0	103.6	100.0	100.1	94.9	0.0	70.8	100.0	100.0	99.9	100.0	94.9	88.7
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	7.0	99.9	35.8	0.1	0.0	0.0	0.0	6.3	12.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	7.0	99.9	35.8	0.0	0.0	0.0	0.0	0.0	11.9
<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	6.3	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. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.5.30 ~ 2008.7.13)2. MALFUNCTION OF TURBINE PROTECTION SYSTEM(2008.12.19 ~ 2008.12.21)

## 5. Historical Summary

<b>Date of Construction Start:</b>	23 Dec 1977	<b>Lifetime Generation:</b>	118834.8 GW(e).h
<b>Date of First Criticality:</b>	09 Apr 1983	<b>Cumulative Energy Availability Factor:</b>	86.0%
<b>Date of Grid Connection:</b>	22 Apr 1983	<b>Cumulative Load Factor:</b>	87.7%
<b>Date of Commercial Operation:</b>	25 Jul 1983	<b>Cumulative Unit Capability Factor:</b>	86.1%
		<b>Cumulative Energy Unavailability Factor:</b>	14.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983			Data not provided							
1984	4086.4	605.0	76.1	76.1	76.1	76.1	76.9	76.9	6876	78.3
1985	3731.4	605.0	69.8	73.0	69.8	73.0	70.4	73.7	6641	75.8
1986	3945.2	605.0	75.2	73.7	74.8	73.6	74.4	73.9	6555	74.8
1987	4265.4	605.0	82.1	75.8	81.6	75.6	80.5	75.6	7251	82.8
1988	4504.7	605.0	82.8	77.2	82.8	77.0	84.8	77.4	7275	82.8
1989	5062.8	605.0	95.7	80.3	95.7	80.2	95.5	80.4	8387	95.7
1990	4349.9	605.0	84.3	80.9	84.3	80.7	82.1	80.7	7381	84.3
1991	4554.0	605.0	85.8	81.5	85.8	81.4	85.9	81.3	7512	85.8
1992	4517.2	605.0	85.0	81.9	85.0	81.8	85.0	81.7	7469	85.0
1993	4187.0	605.0	80.5	81.7	80.5	81.6	79.0	81.5	7048	80.5
1994	4693.9	605.0	86.5	82.2	86.5	82.1	88.6	82.1	7685	87.7
1995	5106.6	605.0	94.8	83.2	94.7	83.1	96.4	83.3	8370	95.5
1996	4673.9	605.0	86.1	83.4	86.0	83.4	87.9	83.6	7668	87.3
1997	4620.3	605.0	86.8	83.7	86.6	83.6	87.2	83.9	7639	87.2
1998	4697.6	605.0	84.9	83.7	84.9	83.7	88.6	84.2	7541	86.1
1999	4672.2	605.0	83.6	83.7	83.6	83.7	88.2	84.5	7472	85.3
2000	4914.7	605.0	90.1	84.1	90.1	84.1	92.5	84.9	7812	88.9
2001	4807.8	605.0	87.3	84.3	87.3	84.2	90.7	85.3	7650	87.3
2002	5051.2	605.0	90.6	84.6	90.6	84.6	95.3	85.8	7982	91.1
2003	4844.2	605.0	86.5	84.7	85.4	84.6	91.4	86.1	7709	88.0
2004	5501.5	605.0	97.8	85.3	97.8	85.2	103.5	86.9	8602	97.9
2005	5151.5	605.0	92.1	85.7	92.1	85.6	97.2	87.4	8080	92.2
2006	5099.2	637.0	90.8	85.9	90.8	85.8	91.4	87.5	7984	91.1
2007	5011.0	637.0	89.2	86.0	89.2	85.9	89.8	87.6	7886	90.0
2008	4933.9	637.0	87.6	86.1	87.6	86.0	88.4	87.7	7771	88.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		38			129	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	975			875		
D. Inspection, maintenance or repair without refuelling				37		
E. Testing of plant systems or component					0	
J. Grid limitation, failure or grid unavailability						5
Subtotal	975	38	0	912	132	5
Total		1013			1049	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		23
15. Reactor Cooling System:		5
16. Steam generation system:		3
31. Turbine and auxiliaries	38	39
32. Feedwater and Main Steam System		8
35. All other I&C Systems		0
41. Main Generator System:		43
42. Electrical Power Supply System:		5
Total	38	126

## KR-5 KORI-3

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 979.0 MW(e)  
**Design Net Capacity:** 913.0 MW(e)  
**Design Discharge Burnup:** 17910 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 7564.4 GW(e).h  
**Energy Availability Factor:** 88.8%  
**Load Factor:** 88.2%  
**Operating Factor:** 89.7%  
**Energy Unavailability Factor:** 11.2%  
**Total Off-line Time:** 906 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	724.4	642.4	725.5	628.9	1.7	562.1	723.2	718.5	693.7	721.6	699.8	722.7	7564.4
<b>EAF (%)</b>	100.0	94.7	100.0	89.8	1.9	80.9	100.0	99.6	99.4	100.0	100.0	100.0	88.8
<b>UCF (%)</b>	100.0	94.7	100.0	89.8	1.9	80.9	100.0	100.0	100.0	100.0	100.0	100.0	88.9
<b>LF (%)</b>	99.5	97.6	99.6	89.3	0.2	79.7	99.3	98.6	98.4	98.9	99.3	99.2	88.2
<b>OF (%)</b>	100.0	100.3	100.0	91.5	1.3	84.4	100.0	100.0	100.0	99.9	100.0	100.0	89.7
<b>EUAF (%)</b>	0.0	5.3	0.0	10.2	98.1	19.1	0.0	0.4	0.6	0.0	0.0	0.0	11.2
<b>PUF (%)</b>	0.0	0.0	0.0	10.2	98.1	1.9	0.0	0.0	0.0	0.0	0.0	0.0	9.3
<b>UCLF (%)</b>	0.0	5.3	0.0	0.0	0.0	17.2	0.0	0.0	0.0	0.0	0.0	0.0	1.8
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.6	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. PROTECTION RELAY ACTUATION OF MAIN GENERATOR(2008.2.4 ~ 2008.2.5)2. REFUELING AND MAINTENANCE(2008.4.28 ~ 2008.5.31)3. MAINTENANCE OF S/G DRAIN VALVE(2008.6.7 ~ 2008.6.11)

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1979 **Lifetime Generation:** 163033.4 GW(e).h  
**Date of First Criticality:** 01 Jan 1985 **Cumulative Energy Availability Factor:** 85.6%  
**Date of Grid Connection:** 22 Jan 1985 **Cumulative Load Factor:** 88.5%  
**Date of Commercial Operation:** 30 Sep 1985 **Cumulative Unit Capability Factor:** 85.7%  
**Cumulative Energy Unavailability Factor:** 14.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985			Data not provided							
1986	5611.7	895.0	73.3	73.3	73.3	73.3	71.6	71.6	6529	74.5
1987	5804.8	895.0	79.1	76.2	78.8	76.0	74.0	72.8	6665	76.1
1988	6119.7	895.0	79.7	77.4	79.7	77.3	77.8	74.5	7005	79.7
1989	6592.0	895.0	82.3	78.6	82.3	78.5	84.1	76.9	7206	82.3
1990	6838.1	895.0	90.4	81.0	90.4	80.9	87.2	79.0	7923	90.4
1991	5902.5	895.0	75.1	80.0	75.1	79.9	75.3	78.3	6578	75.1
1992	6746.2	895.0	83.7	80.5	83.7	80.5	85.8	79.4	7349	83.7
1993	7121.8	895.0	88.1	81.5	88.1	81.4	90.8	80.8	7721	88.1
1994	6545.3	890.0	79.3	81.2	79.2	81.2	84.0	81.2	7128	81.4
1995	6015.5	895.0	73.7	80.5	73.7	80.4	76.7	80.7	6863	78.3
1996	7939.7	895.0	95.4	81.9	95.4	81.8	101.0	82.6	8431	96.0
1997	6051.9	895.0	73.8	81.2	73.8	81.1	77.2	82.1	6503	74.2
1998	6902.5	895.0	82.9	81.3	82.8	81.3	88.0	82.6	7325	83.6
1999	7231.8	895.0	86.3	81.7	86.3	81.6	92.2	83.3	7615	86.9
2000	8094.3	895.0	95.6	82.6	95.6	82.6	103.0	84.6	8399	95.6
2001	7570.3	895.0	89.4	83.0	89.4	83.0	96.6	85.3	7881	90.0
2002	7684.8	895.0	90.9	83.5	90.9	83.5	98.0	86.1	8062	92.0
2003	8387.4	895.0	100.0	84.4	99.1	84.3	107.0	87.2	8689	99.2
2004	7312.5	895.0	86.5	84.5	86.5	84.4	93.0	87.5	7630	86.9
2005	7562.2	895.0	89.4	84.8	89.4	84.7	96.5	88.0	7885	90.0
2006	7461.8	963.0	88.3	84.9	88.3	84.9	88.5	88.0	7813	89.2
2007	8214.2	964.0	96.4	85.5	96.4	85.4	97.3	88.5	8503	97.1
2008	7564.4	979.0	88.9	85.7	88.8	85.6	88.2	88.5	7854	89.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		112			90	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	796			999		
D. Inspection, maintenance or repair without refuelling				25		
J. Grid limitation, failure or grid unavailability						4
L. Human factor related		22			3	
Subtotal	796	134	0	1024	100	4
Total		930			1128	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		16
15. Reactor Cooling System:		2
16. Steam generation system:	112	
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		9
35. All other I&C Systems		7
41. Main Generator System:		37
42. Electrical Power Supply System:		0
Total	112	86

## KR-6 KORI-4

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 977.0 MW(e)  
 Design Net Capacity: 913.0 MW(e)  
 Design Discharge Burnup: 18210 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 8348.2 GW(e).h  
 Energy Availability Factor: 97.6%  
 Load Factor: 97.5%  
 Operating Factor: 99.0%  
 Energy Unavailability Factor: 2.4%  
 Total Off-line Time: 86 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	724.7	678.8	725.2	701.5	725.2	701.0	725.4	720.6	695.9	722.2	702.6	525.2	8348.2
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.2	100.0	100.0	100.0	72.8	97.6
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.4	98.8
LF (%)	99.7	103.4	99.8	99.9	99.8	99.6	99.8	99.1	98.9	99.2	99.9	72.3	97.5
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	85.2	99.0
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	27.2	2.4
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.6	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	0.8	0.0	0.0	0.0	12.6	1.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.12.27 ~ )

### 5. Historical Summary

Date of Construction Start: 01 Apr 1980      Lifetime Generation: 163246.3 GW(e).h  
 Date of First Criticality: 26 Oct 1985      Cumulative Energy Availability Factor: 87.4%  
 Date of Grid Connection: 15 Nov 1985      Cumulative Load Factor: 90.5%  
 Date of Commercial Operation: 29 Apr 1986      Cumulative Unit Capability Factor: 87.5%  
    Cumulative Energy Unavailability Factor: 12.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986			Data not provided							
1987	5860.8	895.0	78.3	78.3	78.0	78.0	74.8	74.8	6707	76.6
1988	5909.1	895.0	80.7	79.5	79.8	78.9	75.2	75.0	7006	79.8
1989	6177.4	895.0	77.2	78.7	77.2	78.3	78.8	76.2	6763	77.2
1990	6230.0	895.0	81.5	79.4	81.5	79.1	79.5	77.0	7140	81.5
1991	6353.0	895.0	80.4	79.6	80.0	79.3	81.0	77.8	7011	80.0
1992	6652.3	895.0	82.7	80.1	82.7	79.9	84.6	79.0	7266	82.7
1993	6835.9	895.0	85.1	80.9	85.1	80.6	87.2	80.1	7456	85.1
1994	7455.1	890.0	90.0	82.0	90.0	81.8	95.6	82.1	8160	93.2
1995	6950.6	890.0	89.3	82.8	89.3	82.6	89.2	82.9	7824	89.3
1996	6678.4	895.0	80.0	82.5	80.0	82.4	84.9	83.1	7147	81.4
1997	7014.2	895.0	84.4	82.7	84.4	82.5	89.5	83.6	7450	85.0
1998	8433.7	895.0	100.0	84.1	100.0	84.0	107.6	85.6	8760	100.0
1999	7129.0	895.0	84.6	84.2	84.6	84.0	90.9	86.0	7451	85.1
2000	7334.4	895.0	86.2	84.3	86.2	84.2	93.3	86.6	7578	86.3
2001	7615.1	895.0	90.0	84.7	90.0	84.6	97.1	87.3	7929	90.5
2002	8495.5	895.0	100.0	85.6	100.0	85.5	108.4	88.6	8760	100.0
2003	7597.0	895.0	90.5	85.9	89.6	85.8	96.9	89.1	7913	90.3
2004	7378.6	895.0	86.8	86.0	86.8	85.8	93.9	89.3	7669	87.3
2005	8397.2	895.0	99.2	86.7	99.2	86.5	107.1	90.3	8695	99.3
2006	7520.4	967.0	90.7	86.9	90.7	86.8	88.8	90.2	7824	89.3
2007	7500.9	966.0	88.0	87.0	88.0	86.8	88.6	90.1	7967	90.9
2008	8348.2	977.0	98.8	87.5	97.6	87.4	97.5	90.5	8674	99.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					34	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	110			963		
D. Inspection, maintenance or repair without refuelling				25		
E. Testing of plant systems or component					0	
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						5
Subtotal	110	0	0	988	35	9
Total	110			1032		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
15. Reactor Cooling System:		4
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries:		11
32. Feedwater and Main Steam System		7
41. Main Generator System:		0
42. Electrical Power Supply System:		10
Total	0	32



# KR-9 ULCHIN-1

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 945.0 MW(e)  
 Design Net Capacity: 950.0 MW(e)  
 Design Discharge Burnup: 42500 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 8177.4 GW(e).h  
 Energy Availability Factor: 99.1%  
 Load Factor: 98.8%  
 Operating Factor: 99.9%  
 Energy Unavailability Factor: 0.9%  
 Total Off-line Time: 13 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	699.8	654.4	699.9	677.6	700.1	676.8	662.8	695.3	667.5	667.5	676.4	699.2	8177.4
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	95.1	99.3	99.4	95.9	100.0	100.0	99.1
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	95.1	100.0	99.4	96.0	100.0	100.0	99.2
LF (%)	99.5	103.1	99.6	99.7	99.6	99.5	94.3	98.9	98.1	94.8	99.4	99.4	98.8
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	97.2	100.0	100.0	97.7	100.0	100.0	99.9
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.7	0.6	4.1	0.0	0.0	0.9
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	4.9	0.0	0.6	4.1	0.0	0.0	0.8
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

1. MALFUNCTION OF MAIN STEAM PRESSURE CHANNEL PROTECTION CARD(2008.7.3 ~ 2008.7.4)2.MALFUNCTION OF TURBINE CONTROL SYSTEM(2008.10.26 ~ 2008.10.27)

## 5. Historical Summary

Date of Construction Start: 26 Jan 1983      Lifetime Generation: 141658.1 GW(e).h  
 Date of First Criticality: 25 Feb 1988      Cumulative Energy Availability Factor: 86.2%  
 Date of Grid Connection: 07 Apr 1988      Cumulative Load Factor: 86.5%  
 Date of Commercial Operation: 10 Sep 1988      Cumulative Unit Capability Factor: 86.5%  
    Cumulative Energy Unavailability Factor: 13.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988			Data not provided							
1989	5205.4	920.0	66.4	66.4	66.4	66.4	64.6	64.6	5821	66.4
1990	6166.2	920.0	81.7	74.1	81.7	74.1	76.5	70.6	7156	81.7
1991	7244.3	920.0	91.0	79.7	91.0	79.7	89.9	77.0	7970	91.0
1992	7020.8	920.0	87.4	81.6	87.4	81.6	86.9	79.5	7675	87.4
1993	6977.6	920.0	87.3	82.8	87.3	82.8	86.6	80.9	7651	87.3
1994	6878.5	890.0	82.0	82.6	82.0	82.6	88.2	82.1	7293	83.3
1995	7153.8	920.0	85.7	83.1	85.7	83.1	88.8	83.0	7698	87.9
1996	7113.7	920.0	85.6	83.4	85.4	83.4	88.0	83.7	7631	86.9
1997	6801.0	920.0	83.7	83.4	82.3	83.3	84.4	83.7	7323	83.6
1998	7643.0	920.0	94.1	84.5	91.4	84.1	94.8	84.9	8256	94.2
1999	7161.6	920.0	86.1	84.7	86.1	84.3	88.9	85.2	7639	87.2
2000	7230.8	920.0	86.8	84.8	86.3	84.4	89.5	85.6	7736	88.1
2001	7022.3	920.0	85.1	84.9	84.5	84.4	87.1	85.7	7483	85.4
2002	5462.4	920.0	76.0	84.2	76.0	83.8	67.8	84.4	6052	69.1
2003	6371.6	920.0	85.2	84.3	85.2	83.9	79.1	84.1	7446	85.0
2004	7420.1	920.0	89.5	84.6	89.3	84.3	91.8	84.5	7970	90.7
2005	8245.0	920.0	99.9	85.5	99.8	85.2	102.3	85.6	8760	100.0
2006	7212.8	939.0	88.1	85.7	87.5	85.3	87.7	85.7	7769	88.7
2007	7262.2	940.0	88.0	85.8	88.0	85.5	88.2	85.8	7747	88.4
2008	8177.4	945.0	99.2	86.5	99.1	86.2	98.8	86.5	8747	99.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		37		128	165	
B. Refuelling without a maintenance					10	
C. Inspection, maintenance or repair combined with refuelling				875		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						5
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Subtotal	0	37	0	1003	175	5
Total		37			1183	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
15. Reactor Cooling System:		3
17. Safety I&C Systems (excluding reactor I&C)	21	0
31. Turbine and auxiliaries:	15	3
32. Feedwater and Main Steam System		6
41. Main Generator System:		223
42. Electrical Power Supply System:		7
Total	36	242

## KR-10 ULCHIN-2

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: FRAM (FRAMATOME)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 942.0 MW(e)  
 Design Net Capacity: 950.0 MW(e)  
 Design Discharge Burnup: 42500 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 7264.2 GW(e).h  
 Energy Availability Factor: 87.9%  
 Load Factor: 88.0%  
 Operating Factor: 88.5%  
 Energy Unavailability Factor: 12.1%  
 Total Off-line Time: 1008 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	701.2	655.6	701.3	679.1	701.4	678.0	699.1	696.7	353.6	15.2	678.4	704.6	7264.2
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	53.2	3.6	99.6	100.0	87.9
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	53.2	3.6	99.6	100.0	87.9
LF (%)	100.0	103.6	100.1	100.3	100.1	100.0	99.7	99.4	52.1	2.2	100.0	100.5	88.0
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	54.7	5.1	100.0	100.0	88.5
EUAF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	46.8	96.4	0.4	0.0	12.1
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.8	96.4	0.4	0.0	12.1
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	0.1	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.9.17 ~ 2008.10.30)

### 5. Historical Summary

Date of Construction Start: 05 Jul 1983      Lifetime Generation: 136500.7 GW(e).h  
 Date of First Criticality: 25 Feb 1989      Cumulative Energy Availability Factor: 86.8%  
 Date of Grid Connection: 14 Apr 1989      Cumulative Load Factor: 88.2%  
 Date of Commercial Operation: 30 Sep 1989      Cumulative Unit Capability Factor: 87.0%  
    Cumulative Energy Unavailability Factor: 13.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	Data not provided									
1990	5547.3	920.0	73.0	73.0	73.0	73.0	68.8	68.8	6395	73.0
1991	6671.2	920.0	86.8	79.9	86.8	79.9	82.8	75.8	7603	86.8
1992	7076.9	920.0	87.5	82.4	87.5	82.4	87.6	79.7	7686	87.5
1993	7230.2	920.0	87.8	83.8	87.8	83.8	89.7	82.2	7693	87.8
1994	6889.7	890.0	81.5	83.3	81.5	83.3	88.4	83.4	7315	83.5
1995	7810.3	920.0	93.4	85.0	93.4	85.0	96.9	85.7	8223	93.9
1996	7696.4	920.0	91.3	85.9	91.0	85.9	95.2	87.1	8151	92.8
1997	7055.2	920.0	86.0	85.9	84.3	85.7	87.5	87.1	7534	86.0
1998	7388.9	920.0	88.5	86.2	88.3	86.0	91.7	87.6	7947	90.7
1999	7815.2	920.0	94.6	87.1	94.5	86.8	97.0	88.6	8748	99.9
2000	6836.8	920.0	82.5	86.6	82.3	86.4	84.6	88.2	7330	83.4
2001	7268.6	920.0	90.2	86.9	89.2	86.7	90.2	88.4	7848	89.6
2002	6485.8	920.0	78.3	86.3	78.3	86.0	80.5	87.8	6939	79.2
2003	7253.8	920.0	87.1	86.3	87.1	86.1	90.0	87.9	7686	87.7
2004	7253.7	920.0	88.6	86.5	88.6	86.3	89.8	88.0	7888	89.8
2005	6582.4	920.0	80.8	86.1	80.7	85.9	81.7	87.6	7218	82.4
2006	7882.5	937.0	97.0	86.8	96.7	86.6	96.0	88.1	8510	97.1
2007	7391.6	937.0	90.0	87.0	90.0	86.8	90.1	88.3	7946	90.7
2008	7264.2	942.0	87.9	87.0	87.9	86.8	88.0	88.2	7752	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure	1032				120	
C. Inspection, maintenance or repair combined with refuelling				894	1	
D. Inspection, maintenance or repair without refuelling				65		
E. Testing of plant systems or component:					2	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						8
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						0
Subtotal	1032	0	0	959	123	8
Total	1032			1090		

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		60
32. Feedwater and Main Steam System		0
41. Main Generator System		54
42. Electrical Power Supply System		3
Total	0	117

## KR-13 ULCHIN-3

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPANY)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 994.0 MW(e)  
**Design Net Capacity:** 1050.0 MW(e)  
**Design Discharge Burnup:** 45800 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 8034.7 GW(e).h  
**Energy Availability Factor:** 91.6%  
**Load Factor:** 92.3%  
**Operating Factor:** 92.7%  
**Energy Unavailability Factor:** 8.4%  
**Total Off-line Time:** 638 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	706.1	686.1	714.4	719.4	743.7	689.9	123.5	738.3	714.6	738.9	717.6	742.4	8034.7
<b>EAF (%)</b>	94.6	98.7	95.8	100.0	100.0	96.0	16.6	99.9	99.8	100.0	100.0	100.0	91.6
<b>UCF (%)</b>	94.7	98.7	95.8	100.0	100.0	96.0	16.6	100.0	100.0	100.0	100.0	100.0	91.7
<b>LF (%)</b>	95.5	102.7	96.6	100.7	100.6	96.4	16.7	99.8	99.8	99.8	100.3	100.4	92.3
<b>OF (%)</b>	96.1	102.2	97.3	100.1	100.0	98.1	20.7	100.0	100.0	99.9	100.0	100.0	92.7
<b>EUF (%)</b>	5.4	1.3	4.2	0.0	0.0	4.0	83.4	0.1	0.2	0.0	0.0	0.0	8.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	4.0	83.4	0.0	0.0	0.0	0.0	0.0	7.4
<b>UCLF (%)</b>	5.3	1.3	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. TURBINE TRIP BY TURBINE PROTECTION SIGNAL(2008.1.25 ~ 2008.1.26) 2. MAIN GENERATOR FIELD BREAKER TRIP(2008.2.29 ~ 2008.3.1) 3. REFUELING AND MAINTENANCE(2008.6.30 ~ 2008.7.25)

### 5. Historical Summary

**Date of Construction Start:** 21 Jul 1993 **Lifetime Generation:** 81966.7 GW(e).h  
**Date of First Criticality:** 21 Dec 1997 **Cumulative Energy Availability Factor:** 90.7%  
**Date of Grid Connection:** 06 Jan 1998 **Cumulative Load Factor:** 90.4%  
**Date of Commercial Operation:** 11 Aug 1998 **Cumulative Unit Capability Factor:** 90.9%  
**Cumulative Energy Unavailability Factor:** 9.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1998	3495.9	960.0	100.0	100.0	100.0	100.0	99.2	99.2	3589	97.7
1999	6918.0	960.0	81.4	86.9	79.7	85.7	82.3	87.3	7149	81.6
2000	7489.1	960.0	87.0	87.0	87.0	86.2	88.8	87.9	7734	88.0
2001	7922.2	960.0	91.3	88.2	91.3	87.7	94.2	89.7	8025	91.6
2002	7031.3	960.0	89.0	88.4	89.0	88.0	83.6	88.4	7824	89.3
2003	7984.3	960.0	99.6	90.4	99.6	90.1	94.9	89.6	8758	100.0
2004	7187.6	960.0	90.0	90.4	90.0	90.1	85.2	88.9	7986	90.9
2005	7651.7	960.0	87.7	90.0	87.6	89.8	91.0	89.2	7834	89.4
2006	8425.9	994.0	96.6	90.8	96.6	90.6	96.8	90.1	8501	97.0
2007	7901.9	995.0	90.3	90.8	90.3	90.6	90.7	90.2	7970	91.0
2008	8034.7	994.0	91.7	90.9	91.6	90.7	92.3	90.4	8122	92.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1999 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure C. Inspection, maintenance or repair combined with refuelling	604	58		662	51	
Subtotal	604	58	0	662	51	0
Total	662			713		

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

System	2008 Hours Lost	1999 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		22
31. Turbine and auxiliaries	29	
32. Feedwater and Main Steam System		3
41. Main Generator Systems	29	25
Total	58	50

## KR-14 ULCHIN-4

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPANY)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 998.0 MW(e)  
**Design Net Capacity:** 960.0 MW(e)  
**Design Discharge Burnup:** 46603 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 8762.8 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 100.2%  
**Operating Factor:** 100.3%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** -24 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	744.5	696.1	744.7	721.0	744.5	718.8	740.5	738.2	715.2	740.6	717.5	741.2	8762.8
<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>	100.3	103.8	100.3	100.5	100.3	100.0	99.7	99.4	99.5	99.6	99.9	99.8	100.2
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<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. 2008 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 01 Nov 1993  
**Date of First Criticality:** 14 Dec 1998  
**Date of Grid Connection:** 28 Dec 1998  
**Date of Commercial Operation:** 31 Dec 1999

**Lifetime Generation:** 71197.6 GW(e).h  
**Cumulative Energy Availability Factor:** 90.8%  
**Cumulative Load Factor:** 92.9%  
**Cumulative Unit Capability Factor:** 90.9%  
**Cumulative Energy Unavailability Factor:** 9.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1999	Data not provided									
2000	7042.5	960.0	81.3	81.3	81.3	81.3	83.5	83.5	7229	82.3
2001	7732.3	960.0	90.0	85.6	89.9	85.6	91.9	87.7	7880	90.0
2002	7311.3	960.0	84.0	85.1	83.8	85.0	86.9	87.5	7448	85.0
2003	7922.5	960.0	91.6	86.7	91.6	86.7	94.2	89.1	8081	92.2
2004	8623.1	960.0	98.7	89.1	98.7	89.1	102.3	91.8	8700	99.0
2005	8003.0	960.0	91.5	89.5	91.3	89.4	95.2	92.3	8085	92.3
2006	7886.2	993.0	89.8	89.6	89.8	89.5	90.7	92.1	7938	90.6
2007	7912.9	992.0	91.0	89.7	90.3	89.6	91.1	92.0	7998	91.3
2008	8762.8	998.0	100.0	90.9	100.0	90.8	100.2	92.9	8784	100.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2000 to 2008 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				711		
L. Human factor related					0	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						4
Subtotal	0	0	0	711	35	4
Total	0			750		

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

System	2008 Hours Lost	2000 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		10
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		6
41. Main Generator System		9
42. Electrical Power Supply System		8
Total	0	34



## KR-19 ULCHIN-5

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: DHICKOPC (DOOSAN HEAVY INDUSTRIES &amp; CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPANY)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1001.0 MW(e)  
 Design Net Capacity: 1050.0 MW(e)  
 Design Discharge Burnup: 38723 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 8763.8 GW(e).h  
 Energy Availability Factor: 99.9%  
 Load Factor: 99.9%  
 Operating Factor: 100.3%  
 Energy Unavailability Factor: 0.1%  
 Total Off-line Time: -24 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	740.3	695.7	744.3	720.6	744.2	719.3	742.5	740.3	714.1	740.8	718.8	743.0	8763.8
EAF (%)	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	100.0	100.0	100.0	99.9
UCF (%)	99.6	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 (%)	99.4	103.4	99.9	100.1	99.9	99.8	99.7	99.4	99.1	99.3	99.7	99.8	99.9
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
EUF (%)	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	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 (%)	0.4	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	0.3	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 01 Oct 1999      Lifetime Generation: 35634.5 GW(e).h  
 Date of First Criticality: 28 Nov 2003      Cumulative Energy Availability Factor: 92.3%  
 Date of Grid Connection: 18 Dec 2003      Cumulative Load Factor: 91.8%  
 Date of Commercial Operation: 29 Jul 2004      Cumulative Unit Capability Factor: 92.4%  
    Cumulative Energy Unavailability Factor: 7.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2004	3648.4	960.0	98.2	98.2	98.2	98.2	86.0	86.0	3669	83.1
2005	7321.6	960.0	83.8	88.6	83.8	88.6	87.1	86.7	7409	84.6
2006	7882.8	994.0	90.6	89.4	90.6	89.4	90.5	88.3	7925	90.5
2007	8025.9	995.0	91.9	90.1	91.9	90.1	92.1	89.4	8115	92.6
2008	8763.8	1001.0	100.0	92.4	99.9	92.3	99.9	91.8	8784	100.3

### 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2004 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure C. Inspection, maintenance or repair combined with refuelling				526	54	
Subtotal	0	0	0	526	54	0
Total	0			580		

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

System	2008 Hours Lost	2004 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		14
12. Reactor I&C Systems		37
35. All other I&C Systems		2
Total	0	53

## KR-20 ULCHIN-6

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPANY)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power at the beginning of 2008:** 1001.0 MW(e)  
**Design Net Capacity:** 1050.0 MW(e)  
**Design Discharge Burnup:** 38829 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 8107.9 GW(e).h  
**Energy Availability Factor:** 92.6%  
**Load Factor:** 92.5%  
**Operating Factor:** 93.2%  
**Energy Unavailability Factor:** 7.4%  
**Total Off-line Time:** 592 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	741.1	694.4	742.2	718.6	742.5	717.9	741.0	738.6	119.3	687.4	720.7	744.1	8107.9
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	17.2	92.7	100.0	100.0	92.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	17.2	92.7	100.0	100.0	92.6
<b>LF (%)</b>	99.5	103.2	99.7	99.8	99.7	99.6	99.5	99.2	16.6	92.2	100.0	99.9	92.5
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	18.1	96.4	100.0	100.0	93.2
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	82.8	7.3	0.0	0.0	7.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	82.8	7.3	0.0	0.0	7.4
<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. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.9.6 ~ 2008.10.2)

### 5. Historical Summary

**Date of Construction Start:** 29 Sep 2000  
**Date of First Criticality:** 16 Dec 2004  
**Date of Grid Connection:** 07 Jan 2005  
**Date of Commercial Operation:** 22 Apr 2005

**Lifetime Generation:** 29432.5 GW(e).h  
**Cumulative Energy Availability Factor:** 91.8%  
**Cumulative Load Factor:** 90.6%  
**Cumulative Unit Capability Factor:** 92.0%  
**Cumulative Energy Unavailability Factor:** 8.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2005	6011.0	960.0	99.0	99.0	99.0	99.0	94.9	94.9	6041	91.5
2006	7409.9	991.0	86.7	91.8	86.7	91.8	85.4	89.4	7543	86.1
2007	7911.3	994.0	91.6	91.8	90.9	91.5	90.9	89.9	8022	91.6
2008	8107.9	1001.0	92.6	92.0	92.6	91.8	92.5	90.6	8168	93.2

### 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2005 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					33	
C. Inspection, maintenance or repair combined with refuelling	616			457		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						12
Subtotal	616	0	0	457	33	12
Total	616			502		

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

System	2008 Hours Lost	2005 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		13
41. Main Generator System		19
Total	0	32

# 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  
 at the beginning of 2008: 597.0 MW(e)  
 Design Net Capacity: 629.0 MW(e)  
 Design Discharge Burnup: 7500 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 4885.6 GW(e).h  
 Energy Availability Factor: 91.7%  
 Load Factor: 93.4%  
 Operating Factor: 95.7%  
 Energy Unavailability Factor: 8.3%  
 Total Off-line Time: 373 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	198.3	410.5	436.9	422.2	435.9	422.9	432.5	429.7	415.4	432.3	418.7	430.4	4885.6
EAF (%)	45.7	96.6	96.5	96.4	96.3	96.5	95.8	95.7	95.7	95.8	95.6	95.3	91.7
UCF (%)	45.7	96.6	96.5	96.4	96.3	96.5	95.8	95.7	95.7	95.8	95.6	95.3	91.7
LF (%)	44.6	102.3	98.4	98.4	98.1	98.4	97.4	96.7	96.6	97.2	97.4	96.9	93.4
OF (%)	46.6	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	95.7
EUf (%)	54.3	3.4	3.5	3.6	3.7	3.5	4.2	4.3	4.3	4.2	4.4	4.7	8.3
PUF (%)	54.1	3.1	3.1	3.1	3.3	3.1	3.8	3.9	3.8	3.8	4.0	4.3	7.9
UCLF (%)	0.2	0.3	0.4	0.5	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.5	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. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2007.11.30 ~ 2008.1.17)

## 5. Historical Summary

Date of Construction Start: 30 Oct 1977      Lifetime Generation: 123059.7 GW(e).h  
 Date of First Criticality: 21 Nov 1982      Cumulative Energy Availability Factor: 84.1%  
 Date of Grid Connection: 31 Dec 1982      Cumulative Load Factor: 86.9%  
 Date of Commercial Operation: 22 Apr 1983      Cumulative Unit Capability Factor: 84.5%  
    Cumulative Energy Unavailability Factor: 15.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	2507.4	628.0	60.4	60.4	60.4	60.4	60.5	60.5	5095	77.2
1984	3693.2	629.0	66.8	64.1	66.8	64.1	66.8	64.1	6202	70.6
1985	5246.5	629.0	95.7	75.6	94.0	74.9	95.2	75.4	8277	94.5
1986	4420.4	629.0	80.9	77.0	80.8	76.5	80.2	76.7	7079	80.8
1987	5155.8	629.0	94.4	80.7	93.9	80.2	93.6	80.2	8185	93.4
1988	4415.3	629.0	80.1	80.6	80.1	80.1	79.9	80.2	7033	80.1
1989	5053.2	629.0	68.8	78.8	68.8	78.5	91.7	81.9	8036	91.7
1990	4770.3	629.0	86.0	79.7	86.0	79.4	86.6	82.5	7532	86.0
1991	5062.0	629.0	90.5	81.0	90.5	80.7	91.9	83.6	7927	90.5
1992	4843.3	629.0	85.5	81.4	85.5	81.2	87.7	84.0	7510	85.5
1993	5611.3	629.0	99.0	83.1	99.0	82.8	101.8	85.6	8671	99.0
1994	4583.1	629.0	80.5	82.8	80.4	82.6	83.2	85.4	7150	81.6
1995	4647.1	629.0	80.9	82.7	80.9	82.5	84.3	85.3	7266	82.9
1996	4508.2	629.0	78.5	82.4	78.0	82.2	81.6	85.1	7029	80.0
1997	5689.6	629.0	99.6	83.6	99.6	83.3	103.3	86.3	8732	99.7
1998	4360.4	629.0	76.5	83.1	76.5	82.9	79.1	85.9	6730	76.8
1999	4613.0	629.0	80.7	83.0	80.7	82.8	83.7	85.7	7087	80.9
2000	4511.6	629.0	79.0	82.7	79.0	82.6	81.7	85.5	6993	79.6
2001	4622.0	629.0	81.3	82.7	81.3	82.5	83.9	85.4	7153	81.7
2002	5516.2	629.0	97.2	83.4	97.1	83.2	100.1	86.2	8543	97.5
2003	4980.0	629.0	88.1	83.6	88.1	83.5	90.4	86.4	7715	88.1
2004	5027.5	629.0	89.4	83.9	88.2	83.7	91.0	86.6	7855	89.4
2005	4296.3	629.0	82.5	83.8	75.9	83.3	78.0	86.2	7261	82.9
2006	4627.6	578.0	90.2	84.1	90.2	83.6	91.4	86.4	7998	91.3
2007	4721.9	578.0	88.3	84.2	88.3	83.8	93.3	86.7	7955	90.8
2008	4885.6	597.0	91.7	84.5	91.7	84.1	93.4	86.9	8387	95.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					87	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	396			671		
D. Inspection, maintenance or repair without refuelling				350		
E. Testing of plant systems or component:				4		
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						5
L. Human factor related					2	
Subtotal	396	0	0	1025	92	7
Total		396			1124	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		38
13. Reactor Auxiliary System:		4
14. Safety Systems		4
15. Reactor Cooling System:		11
16. Steam generation system:		1
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		9
41. Main Generator System:		1
42. Electrical Power Supply System:		3
Total	0	80

## KR-4 WOLSONG-2

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** AECL/DHI (ATOMIC ENERGY OF CANADA LTD./DOOSAN HEAVY INDUSTRY & CONSTRUCTION)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 710.0 MW(e)  
**Design Net Capacity:** 663.0 MW(e)  
**Design Discharge Burnup:** 7500 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 5700.3 GW(e).h  
**Energy Availability Factor:** 91.9%  
**Load Factor:** 91.7%  
**Operating Factor:** 92.2%  
**Energy Unavailability Factor:** 8.1%  
**Total Off-line Time:** 679 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	529.9	496.1	530.0	512.6	49.9	507.6	526.5	519.3	500.6	523.4	510.4	493.9	5700.3
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	12.9	100.0	100.0	99.4	99.0	100.0	100.0	93.9	91.9
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	12.9	100.0	100.0	100.0	100.0	100.0	100.0	93.9	92.1
<b>LF (%)</b>	100.3	104.0	100.3	100.4	9.4	99.3	99.7	98.3	97.9	99.0	99.8	93.5	91.7
<b>OF (%)</b>	100.0	103.6	100.0	100.1	10.9	100.0	100.0	100.0	100.0	99.9	100.0	94.6	92.2
<b>EUAF (%)</b>	0.0	0.0	0.0	0.0	87.1	0.0	0.0	0.6	1.0	0.0	0.0	6.1	8.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	87.1	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. INAPPROPRIATE GADOLINIUM INJECTION DURING THE PERIODIC TEST(2008.12.4 ~ 2008.12.6)

### 5. Historical Summary

**Date of Construction Start:** 25 Sep 1992      **Lifetime Generation:** 63375.9 GW(e).h  
**Date of First Criticality:** 29 Jan 1997      **Cumulative Energy Availability Factor:** 91.0%  
**Date of Grid Connection:** 01 Apr 1997      **Cumulative Load Factor:** 94.4%  
**Date of Commercial Operation:** 01 Jul 1997      **Cumulative Unit Capability Factor:** 91.1%  
**Cumulative Energy Unavailability Factor:** 9.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1997	2804.3	650.0	94.7	94.7	94.7	94.7	97.7	97.7	4199	95.1
1998	4788.7	650.0	81.0	85.6	81.0	85.6	84.1	88.7	7144	81.6
1999	5211.8	650.0	88.1	86.6	88.1	86.6	91.5	89.8	7754	88.5
2000	5346.8	650.0	91.5	88.0	91.5	88.0	93.6	90.9	7843	89.3
2001	5585.4	650.0	93.0	89.1	92.8	89.1	98.1	92.5	8188	93.5
2002	5266.0	650.0	87.7	88.8	87.7	88.8	92.5	92.5	7717	88.1
2003	5480.6	650.0	91.2	89.2	91.2	89.2	96.3	93.1	8015	91.5
2004	5465.5	650.0	90.9	89.4	90.9	89.4	95.7	93.4	8015	91.2
2005	5641.3	650.0	93.9	90.0	93.9	89.9	99.1	94.1	8243	94.1
2006	5975.8	684.0	99.3	91.0	99.3	91.0	99.7	94.7	8711	99.4
2007	5618.8	683.0	90.6	91.0	90.6	90.9	93.9	94.6	7948	90.7
2008	5700.3	710.0	92.1	91.1	91.9	91.0	91.7	94.4	8081	92.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1997 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					24	
C. Inspection, maintenance or repair combined with refuelling				354		
D. Inspection, maintenance or repair without refuelling	663			304		
J. Grid limitation, failure or grid unavailability						6
L. Human factor related		40				
Subtotal	663	40	0	658	24	6
Total		703			688	

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

System	2008 Hours Lost	1997 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		5
16. Steam generation system:		4
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		7
41. Main Generator System:		2
42. Electrical Power Supply System:		1
Total	0	22

## KR-15 WOLSONG-3

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** AECL/DHI (ATOMIC ENERGY OF CANADA LTD./DOOSAN HEAVY INDUSTRY & CONSTRUCTION)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 707.0 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 2008

**Net Energy Production:** 5761.1 GW(e).h  
**Energy Availability Factor:** 92.6%  
**Load Factor:** 93.0%  
**Operating Factor:** 92.8%  
**Energy Unavailability Factor:** 7.4%  
**Total Off-line Time:** 631 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	531.7	497.4	531.7	511.3	528.2	496.5	68.8	522.5	503.1	525.6	513.0	531.5	5761.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	97.8	16.2	99.7	99.3	100.0	100.0	100.0	92.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	97.8	16.2	100.0	100.0	100.0	100.0	100.0	92.7
<b>LF (%)</b>	101.1	104.7	101.1	100.6	100.4	97.5	13.1	99.3	98.8	99.8	100.8	101.0	93.0
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	97.9	14.0	100.0	100.0	99.9	100.0	100.0	92.8
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	2.2	83.8	0.3	0.7	0.0	0.0	0.0	7.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	2.2	83.8	0.0	0.0	0.0	0.0	0.0	7.3
<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	0.3	0.7	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.6.30 ~ 2008.7.27)

### 5. Historical Summary

**Date of Construction Start:** 17 Mar 1994      **Lifetime Generation:** 58372.5 GW(e).h  
**Date of First Criticality:** 19 Feb 1998      **Cumulative Energy Availability Factor:** 92.4%  
**Date of Grid Connection:** 25 Mar 1998      **Cumulative Load Factor:** 94.8%  
**Date of Commercial Operation:** 01 Jul 1998      **Cumulative Unit Capability Factor:** 92.5%  
**Cumulative Energy Unavailability Factor:** 7.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1998	2839.3	650.0	96.1	96.1	96.1	96.1	98.9	98.9	4257	96.4
1999	4696.7	650.0	80.2	85.6	80.2	85.6	82.5	88.0	7008	80.0
2000	5925.2	650.0	99.9	91.3	99.9	91.3	103.8	94.3	8784	100.0
2001	4923.9	650.0	85.3	89.6	85.3	89.6	86.5	92.1	7409	84.6
2002	5043.3	650.0	91.8	90.1	91.8	90.1	88.6	91.3	8083	92.3
2003	5579.5	650.0	93.1	90.6	93.1	90.6	98.0	92.5	8176	93.3
2004	5540.3	650.0	92.5	90.9	92.2	90.9	97.0	93.2	8152	92.8
2005	5997.9	650.0	100.0	92.1	100.0	92.1	105.3	94.8	8760	100.0
2006	5617.8	682.0	93.4	92.3	93.4	92.3	94.0	94.7	8205	93.7
2007	5826.6	681.0	93.8	92.4	93.8	92.4	97.7	95.0	8239	94.1
2008	5761.1	707.0	92.7	92.5	92.6	92.4	93.0	94.8	8129	92.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1999 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					28	
C. Inspection, maintenance or repair combined with refuelling				373		
D. Inspection, maintenance or repair without refuelling	654			196		
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.)			18			
Subtotal	654	0	18	569	28	1
Total	672			598		

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

System	2008 Hours Lost	1999 to 2008 Average Hours Lost Per Year
16. Steam generation system:		0
21. Fuel Handling and Storage Facilities		4
35. All other I&C Systems		24
Total	0	28



## KR-16 WOLSONG-4

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** AECL/DHI (ATOMIC ENERGY OF CANADA LTD./DOOSAN HEAVY INDUSTRY & CONSTRUCTION)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 708.0 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 2008

**Net Energy Production:** 5861.4 GW(e).h  
**Energy Availability Factor:** 94.1%  
**Load Factor:** 94.5%  
**Operating Factor:** 94.4%  
**Energy Unavailability Factor:** 5.9%  
**Total Off-line Time:** 489 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	530.4	496.4	531.0	141.5	530.1	510.4	528.8	521.9	502.8	525.3	512.1	530.6	5861.4
<b>EAF (%)</b>	100.0	100.0	100.0	29.5	100.0	100.0	100.0	99.7	99.3	100.0	100.0	100.0	94.1
<b>UCF (%)</b>	100.0	100.0	100.0	29.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.2
<b>LF (%)</b>	100.7	104.3	100.8	27.8	100.6	100.1	100.4	99.1	98.6	99.6	100.5	100.7	94.5
<b>OF (%)</b>	100.0	103.6	100.0	28.8	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	94.4
<b>EUF (%)</b>	0.0	0.0	0.0	70.5	0.0	0.0	0.0	0.3	0.7	0.0	0.0	0.0	5.9
<b>PUF (%)</b>	0.0	0.0	0.0	70.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8
<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	0.3	0.7	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.4.5 ~ 2008.4.26)

### 5. Historical Summary

**Date of Construction Start:** 22 Jul 1994      **Lifetime Generation:** 52394.6 GW(e).h  
**Date of First Criticality:** 10 Apr 1999      **Cumulative Energy Availability Factor:** 93.8%  
**Date of Grid Connection:** 21 May 1999      **Cumulative Load Factor:** 97.3%  
**Date of Commercial Operation:** 01 Oct 1999      **Cumulative Unit Capability Factor:** 93.8%  
**Cumulative Energy Unavailability Factor:** 6.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1999	1489.2	650.0	99.9	99.9	99.9	99.9	103.8	103.8	2208	100.0
2000	5423.3	650.0	91.4	93.1	91.4	93.1	95.0	96.7	8033	91.5
2001	5493.2	650.0	92.6	92.9	92.6	92.9	96.5	96.6	8110	92.6
2002	5448.1	650.0	90.8	92.2	90.8	92.2	95.7	96.3	7971	91.0
2003	5601.9	650.0	93.5	92.5	93.5	92.5	98.4	96.8	8225	93.9
2004	5620.9	650.0	93.2	92.6	93.2	92.6	98.4	97.1	8209	93.5
2005	5657.9	650.0	93.8	92.8	93.8	92.8	99.4	97.5	8254	94.2
2006	6028.3	685.0	100.0	93.9	100.0	93.9	100.5	97.9	8760	100.0
2007	5770.4	685.0	92.8	93.7	92.8	93.7	96.2	97.7	8157	93.1
2008	5861.4	708.0	94.2	93.8	94.1	93.8	94.5	97.3	8271	94.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2000 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					6	
C. Inspection, maintenance or repair combined with refuelling				216		
D. Inspection, maintenance or repair without refuelling	513			262		
Subtotal	513	0	0	478	6	0
Total	513			484		

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

System	2008 Hours Lost	2000 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		5
31. Turbine and auxiliaries		0
Total	0	5

# KR-7 YONGGWANG-1

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 953.0 MW(e)  
 Design Net Capacity: 938.0 MW(e)  
 Design Discharge Burnup: 18190 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 8434.7 GW(e).h  
 Energy Availability Factor: 99.9%  
 Load Factor: 101.0%  
 Operating Factor: 100.3%  
 Energy Unavailability Factor: 0.1%  
 Total Off-line Time: -24 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	721.6	674.7	722.0	697.9	718.8	690.2	705.7	699.4	677.9	711.7	695.3	719.5	8434.7
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.1	99.3	100.0	100.0	100.0	99.9
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 (%)	101.8	105.4	101.8	101.9	101.4	100.6	99.5	98.6	98.8	100.2	101.3	101.5	101.0
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	0.7	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	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	0.9	0.7	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 04 Jun 1981      Lifetime Generation: 159631.6 GW(e).h  
 Date of First Criticality: 31 Jan 1986      Cumulative Energy Availability Factor: 87.5%  
 Date of Grid Connection: 05 Mar 1986      Cumulative Load Factor: 89.6%  
 Date of Commercial Operation: 25 Aug 1986      Cumulative Unit Capability Factor: 87.5%  
    Cumulative Energy Unavailability Factor: 12.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	2467.9	900.0	95.8	95.8	95.6	95.6	74.7	74.7	2928	79.7
1987	5973.9	900.0	78.8	83.8	78.8	83.7	75.8	75.4	6870	78.4
1988	6199.6	900.0	77.9	81.4	77.9	81.3	78.4	76.7	6844	77.9
1989	6451.8	900.0	81.5	81.4	81.5	81.4	81.8	78.2	7136	81.5
1990	6897.5	900.0	85.7	82.4	85.7	82.3	87.5	80.3	7507	85.7
1991	6695.6	900.0	84.3	82.7	84.3	82.7	84.9	81.1	7383	84.3
1992	6947.3	900.0	86.5	83.3	86.5	83.3	87.9	82.2	7600	86.5
1993	6724.0	900.0	86.8	83.8	86.8	83.8	85.3	82.6	7603	86.8
1994	8230.1	890.0	99.4	85.6	99.4	85.6	105.6	85.3	8751	99.9
1995	6094.6	900.0	74.9	84.5	74.9	84.5	77.3	84.5	6781	77.4
1996	6755.5	900.0	81.4	84.2	81.3	84.2	85.5	84.6	7255	82.6
1997	8236.1	900.0	99.4	85.5	99.4	85.5	104.5	86.3	8741	99.8
1998	7104.5	900.0	85.5	85.5	85.5	85.5	90.1	86.6	7599	86.7
1999	6730.0	900.0	81.1	85.2	81.1	85.2	85.4	86.5	7242	82.7
2000	7215.1	900.0	87.5	85.3	87.5	85.3	91.3	86.8	7696	87.6
2001	8346.4	900.0	99.9	86.3	99.9	86.3	105.9	88.1	8760	100.0
2002	7419.0	900.0	88.8	86.4	88.8	86.4	94.1	88.4	7867	89.8
2003	7074.4	900.0	86.3	86.4	86.3	86.4	89.7	88.5	7593	86.7
2004	7207.2	900.0	86.7	86.5	86.7	86.4	91.2	88.7	7688	87.5
2005	8302.9	900.0	100.0	87.1	100.0	87.1	105.3	89.5	8760	100.0
2006	7545.1	945.0	91.1	87.3	91.1	87.3	91.1	89.6	8030	91.7
2007	6466.5	942.0	77.6	86.9	77.3	86.9	78.4	89.1	6855	78.3
2008	8434.7	953.0	100.0	87.5	99.9	87.5	101.0	89.6	8784	100.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					64	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				946		
D. Inspection, maintenance or repair without refuelling				7		
H. Nuclear regulatory requirement					7	
J. Grid limitation, failure or grid unavailability					0	
Subtotal	0	0	0	953	71	0
Total	0			1024		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		8
15. Reactor Cooling System:		2
16. Steam generation system:		0
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries:		3
32. Feedwater and Main Steam System		3
41. Main Generator System:		39
42. Electrical Power Supply System:		2
XX. Miscellaneous Systems		0
Total	0	61

## KR-8 YONGGWANG-2

Operator: KHNP (Korea Hydro and Nuclear Power Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 947.0 MW(e)  
 Design Net Capacity: 938.0 MW(e)  
 Design Discharge Burnup: 17960 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 7472.9 GW(e).h  
 Energy Availability Factor: 88.9%  
 Load Factor: 90.1%  
 Operating Factor: 89.6%  
 Energy Unavailability Factor: 11.1%  
 Total Off-line Time: 910 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	717.4	670.5	717.9	681.2	715.3	687.6	704.5	699.4	96.9	372.2	692.9	717.1	7472.9
EAF (%)	100.0	100.0	100.0	98.6	100.0	100.0	100.0	99.7	15.1	52.9	100.0	100.0	88.9
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	15.1	52.9	100.0	100.0	89.0
LF (%)	101.8	105.4	101.9	100.0	101.5	100.8	100.0	99.3	14.2	52.8	101.6	101.8	90.1
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	16.7	55.0	100.0	100.0	89.6
EUAF (%)	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.3	84.9	47.1	0.0	0.0	11.1
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84.9	47.1	0.0	0.0	11.0
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	1.4	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.9.6 ~ 2008.10.14)

### 5. Historical Summary

Date of Construction Start: 01 Dec 1981      Lifetime Generation: 149749.4 GW(e).h  
 Date of First Criticality: 15 Oct 1986      Cumulative Energy Availability Factor: 85.4%  
 Date of Grid Connection: 11 Nov 1986      Cumulative Load Factor: 87.5%  
 Date of Commercial Operation: 10 Jun 1987      Cumulative Unit Capability Factor: 85.5%  
    Cumulative Energy Unavailability Factor: 14.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	4297.0	900.0	98.1	98.1	98.1	98.1	97.0	97.0	4826	98.1
1988	6280.9	900.0	80.6	86.9	80.6	86.9	79.4	85.8	7085	80.7
1989	5703.2	900.0	73.6	81.7	73.6	81.7	72.3	80.5	6446	73.6
1990	5964.5	900.0	77.1	80.4	77.1	80.4	75.7	79.2	6757	77.1
1991	6715.0	900.0	84.9	81.4	84.9	81.4	85.2	80.5	7433	84.9
1992	6434.6	900.0	82.6	81.6	82.6	81.6	81.4	80.6	7259	82.6
1993	6930.5	900.0	85.8	82.3	85.7	82.2	87.9	81.7	7506	85.7
1994	7132.9	890.0	85.5	82.7	85.5	82.7	91.5	83.0	7687	87.8
1995	6036.5	900.0	74.2	81.7	74.2	81.7	76.6	82.3	6696	76.4
1996	7656.1	900.0	91.6	82.7	91.6	82.7	96.8	83.8	8189	93.2
1997	6657.3	900.0	81.2	82.6	81.2	82.6	84.4	83.9	7453	85.1
1998	6010.4	900.0	74.5	81.9	74.4	81.9	76.2	83.2	6583	75.1
1999	6718.9	900.0	82.1	81.9	82.1	81.9	85.2	83.4	7301	83.3
2000	7144.1	900.0	87.1	82.3	87.1	82.3	90.4	83.9	7753	88.3
2001	7169.7	900.0	87.1	82.6	87.1	82.6	90.9	84.4	7726	88.2
2002	8194.2	900.0	99.9	83.7	99.6	83.7	103.9	85.6	8744	99.8
2003	7413.3	900.0	89.7	84.1	89.6	84.1	94.0	86.1	7931	90.5
2004	7242.9	900.0	87.5	84.3	87.5	84.3	91.6	86.4	7764	88.4
2005	7302.4	900.0	88.6	84.5	88.6	84.5	92.6	86.8	7881	90.0
2006	8195.7	939.0	100.0	85.3	99.9	85.3	99.6	87.5	8719	99.5
2007	7030.1	936.0	85.1	85.3	84.4	85.3	85.7	87.4	7523	85.9
2008	7472.9	947.0	89.0	85.5	88.9	85.4	90.1	87.5	7850	89.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				1	44	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	933			989		
D. Inspection, maintenance or repair without refuelling				94		
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						0
Subtotal	933	0	0	1084	48	1
Total	933			1133		

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		1
15. Reactor Cooling System:		2
16. Steam generation system:		8
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		4
35. All other I&C Systems:		0
41. Main Generator System:		18
42. Electrical Power Supply System:		7
Total	0	42

## KR-11 YONGGWANG-3

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKAEC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA ATOMICENERGY RESEARCH INS

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 997.0 MW(e)  
**Design Net Capacity:** 1049.0 MW(e)  
**Design Discharge Burnup:** 42700 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 7861.9 GW(e).h  
**Energy Availability Factor:** 90.1%  
**Load Factor:** 90.0%  
**Operating Factor:** 90.9%  
**Energy Unavailability Factor:** 9.9%  
**Total Off-line Time:** 793 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	744.7	696.4	745.2	707.7	742.2	714.8	735.0	730.3	709.0	361.8	229.3	745.7	7861.9
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.2	99.6	49.8	32.6	100.0	90.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	49.8	32.6	100.0	90.2
<b>LF (%)</b>	100.4	103.9	100.5	98.7	100.1	99.6	99.1	98.5	98.8	48.7	31.9	100.5	90.0
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	52.5	35.6	100.0	90.9
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.4	50.2	67.4	0.0	9.9
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.2	67.4	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	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.4	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.10.17 ~ 2008.11.20)

### 5. Historical Summary

**Date of Construction Start:** 23 Dec 1989  
**Date of First Criticality:** 13 Oct 1994  
**Date of Grid Connection:** 30 Oct 1994  
**Date of Commercial Operation:** 31 Mar 1995

**Lifetime Generation:** 105690.4 GW(e).h  
**Cumulative Energy Availability Factor:** 89.3%  
**Cumulative Load Factor:** 90.9%  
**Cumulative Unit Capability Factor:** 89.4%  
**Cumulative Energy Unavailability Factor:** 10.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1995	6430.3	950.0	99.3	99.3	99.3	99.3	92.2	92.2	6573	89.5
1996	6366.2	950.0	74.0	85.5	74.0	85.5	76.3	83.5	6589	75.0
1997	7229.6	950.0	84.0	85.0	84.0	85.0	86.9	84.7	7443	85.0
1998	7400.8	950.0	85.5	85.1	85.5	85.1	88.9	85.8	7566	86.4
1999	7395.3	950.0	86.7	85.4	86.7	85.4	88.9	86.4	7678	87.6
2000	7262.0	950.0	85.6	85.5	85.6	85.5	87.0	86.5	7568	86.2
2001	8629.1	950.0	100.0	87.6	100.0	87.6	103.7	89.0	8760	100.0
2002	7658.2	950.0	89.1	87.8	89.1	87.8	92.0	89.4	7831	89.4
2003	7818.1	950.0	90.1	88.0	90.1	88.0	93.9	89.9	7971	91.0
2004	7654.7	950.0	90.4	88.3	90.3	88.3	91.7	90.1	7801	88.8
2005	8675.6	950.0	100.0	89.4	100.0	89.4	104.2	91.4	8760	100.0
2006	7556.8	985.0	87.4	89.2	87.3	89.2	87.6	91.1	7800	89.0
2007	7778.3	987.0	90.8	89.3	90.2	89.3	90.0	91.0	7916	90.4
2008	7861.9	997.0	90.2	89.4	90.1	89.3	90.0	90.9	7967	90.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1995 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					13	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	817			800		
D. Inspection, maintenance or repair without refuelling				8		
E. Testing of plant systems or component:					0	
Subtotal	817	0	0	808	13	0
Total	817			821		

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

System	2008 Hours Lost	1995 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		2
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		3
35. All other I&C Systems		1
41. Main Generator System		0
42. Electrical Power Supply System		2
Total	0	11



# KR-12 YONGGWANG-4

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKAEC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA ATOMICENERGY RESEARCH INS

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 994.0 MW(e)  
**Design Net Capacity:** 1049.0 MW(e)  
**Design Discharge Burnup:** 42700 MW.d/t  
**Status at end of year:** Operational

## 2. Production Summary 2008

**Net Energy Production:** 7992.6 GW(e).h  
**Energy Availability Factor:** 91.4%  
**Load Factor:** 91.8%  
**Operating Factor:** 92.3%  
**Energy Unavailability Factor:** 8.6%  
**Total Off-line Time:** 676 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	744.4	683.9	745.1	707.6	615.8	105.3	734.0	734.3	713.1	743.0	720.4	745.9	7992.6
<b>EAF (%)</b>	100.0	98.2	100.0	100.0	83.1	15.3	99.5	99.7	100.0	100.0	100.0	100.0	91.4
<b>UCF (%)</b>	100.0	98.2	100.0	100.0	83.1	15.3	99.5	100.0	100.0	100.0	100.0	100.0	91.4
<b>LF (%)</b>	100.7	102.4	100.7	99.0	83.3	14.7	99.3	99.3	99.6	100.3	100.7	100.9	91.8
<b>OF (%)</b>	100.0	103.6	100.0	100.1	84.8	18.5	100.0	100.0	100.0	99.9	100.0	100.0	92.3
<b>EUf (%)</b>	0.0	1.8	0.0	0.0	16.9	84.7	0.5	0.3	0.0	0.0	0.0	0.0	8.6
<b>PUf (%)</b>	0.0	1.8	0.0	0.0	16.9	84.7	0.0	0.0	0.0	0.0	0.0	0.0	8.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.5	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	0.3	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.5.27 ~ 2008.6.25)

## 5. Historical Summary

**Date of Construction Start:** 26 May 1990  
**Date of First Criticality:** 07 Jul 1995  
**Date of Grid Connection:** 18 Jul 1995  
**Date of Commercial Operation:** 01 Jan 1996

**Lifetime Generation:** 100410.6 GW(e).h  
**Cumulative Energy Availability Factor:** 89.4%  
**Cumulative Load Factor:** 91.9%  
**Cumulative Unit Capability Factor:** 89.5%  
**Cumulative Energy Unavailability Factor:** 10.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1996	7197.5	950.0	83.5	83.5	83.5	83.5	86.3	86.3	7565	86.1
1997	6767.7	950.0	78.8	81.1	78.8	81.1	81.3	83.8	7125	81.3
1998	8427.3	950.0	97.1	86.5	97.1	86.5	101.3	89.6	8591	98.1
1999	7627.9	950.0	89.0	87.1	89.0	87.1	91.7	90.1	7883	90.0
2000	7252.3	950.0	84.6	86.6	84.6	86.6	86.9	89.5	7441	84.7
2001	7237.2	950.0	84.8	86.3	84.8	86.3	87.0	89.1	7424	84.7
2002	7653.5	950.0	88.7	86.6	88.7	86.6	92.0	89.5	7808	89.1
2003	8576.8	950.0	98.7	88.1	98.7	88.1	103.1	91.2	8652	98.8
2004	7624.9	950.0	88.3	88.2	88.3	88.2	91.4	91.2	7782	88.6
2005	7755.0	950.0	89.8	88.3	89.8	88.3	93.2	91.4	7879	89.9
2006	8646.2	988.0	100.0	89.4	100.0	89.4	99.9	92.2	8760	100.0
2007	7651.1	987.0	88.4	89.3	87.8	89.3	88.5	91.9	7790	88.9
2008	7992.6	994.0	91.4	89.5	91.4	89.4	91.8	91.9	8084	92.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1996 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					28	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	700			774		
Subtotal	700	0	0	774	28	0
Total	700			802		

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

System	2008 Hours Lost	1996 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		6
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		2
41. Main Generator System		8
42. Electrical Power Supply System		8
Total	0	26

## KR-17 YONGGWANG-5

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPANY)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 988.0 MW(e)  
**Design Net Capacity:** 1050.0 MW(e)  
**Design Discharge Burnup:** 13820 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 7807.4 GW(e).h  
**Energy Availability Factor:** 90.2%  
**Load Factor:** 90.2%  
**Operating Factor:** 91.0%  
**Energy Unavailability Factor:** 9.8%  
**Total Off-line Time:** 788 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	732.8	685.5	733.0	67.9	532.1	713.8	733.6	729.9	708.1	722.5	712.5	735.7	7807.4
<b>EAF (%)</b>	100.0	100.0	100.0	9.5	72.4	100.0	100.0	99.7	99.9	100.0	100.0	100.0	90.2
<b>UCF (%)</b>	100.0	100.0	100.0	9.5	72.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.2
<b>LF (%)</b>	99.7	103.3	99.7	9.6	72.4	100.3	99.8	99.3	99.5	98.2	100.2	100.1	90.2
<b>OF (%)</b>	100.0	103.6	100.0	11.4	76.6	100.0	100.0	100.0	100.0	99.9	100.0	100.0	91.0
<b>EUF (%)</b>	0.0	0.0	0.0	90.5	27.6	0.0	0.0	0.3	0.1	0.0	0.0	0.0	9.8
<b>PUF (%)</b>	0.0	0.0	0.0	90.5	27.6	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.4.4 ~ 2008.5.8)

### 5. Historical Summary

**Date of Construction Start:** 29 Jun 1997      **Lifetime Generation:** 49315.0 GW(e).h  
**Date of First Criticality:** 24 Nov 2001      **Cumulative Energy Availability Factor:** 85.9%  
**Date of Grid Connection:** 19 Dec 2001      **Cumulative Load Factor:** 87.9%  
**Date of Commercial Operation:** 21 May 2002      **Cumulative Unit Capability Factor:** 86.0%  
**Cumulative Energy Unavailability Factor:** 14.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2002	5006.8	950.0	98.7	98.7	98.7	98.7	102.6	102.6	5095	99.2
2003	6694.4	950.0	77.1	85.1	77.1	85.1	80.4	88.6	6856	78.3
2004	5524.5	950.0	63.3	76.7	63.3	76.7	66.2	79.9	5611	63.9
2005	7748.4	950.0	89.0	80.1	88.8	80.1	93.1	83.6	7873	89.9
2006	7688.3	987.0	88.8	82.1	88.8	82.0	88.9	84.8	7859	89.7
2007	8601.7	990.0	99.1	85.2	99.1	85.2	99.2	87.4	8725	99.6
2008	7807.4	988.0	90.2	86.0	90.2	85.9	90.2	87.9	7972	91.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2002 to 2008 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	811			887		
D. Inspection, maintenance or repair without refuelling				57		
E. Testing of plant systems or component:					5	
Subtotal	811	0	0	944	46	0
Total	811			990		

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

System	2008 Hours Lost	2002 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		8
16. Steam generation system:		26
Total	0	34

## KR-18 YONGGWANG-6

**Operator:** KHNP (Korea Hydro and Nuclear Power Co.)

**Contractor:** DHICKOPC (DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO.LTD./KOREA POWER ENGINEERING COMPANY)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power at the beginning of 2008:** 996.0 MW(e)  
**Design Net Capacity:** 1050.0 MW(e)  
**Design Discharge Burnup:** 13450 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 7914.6 GW(e).h  
**Energy Availability Factor:** 90.9%  
**Load Factor:** 90.7%  
**Operating Factor:** 92.2%  
**Energy Unavailability Factor:** 9.1%  
**Total Off-line Time:** 687 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	742.2	695.3	743.4	717.6	738.8	712.5	726.1	727.4	704.0	729.4	65.6	612.2	7914.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	99.2	99.0	99.0	100.0	9.7	82.7	90.9
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	9.7	82.7	91.1
<b>LF (%)</b>	100.2	103.9	100.3	100.2	99.7	99.4	98.0	98.2	98.2	98.3	9.2	82.6	90.7
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	13.3	88.3	92.2
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.0	1.0	0.0	90.3	17.3	9.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.3	10.2	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	0.0	7.2	0.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.0	1.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

1. REFUELING AND MAINTENANCE(2008.11.5 ~ 2008.12.2)2. MALFUNCTION OF THE SHUTDOWN ROD POSITION TRANSMITTER(2008.12.6 ~ 2008.12.8)

### 5. Historical Summary

**Date of Construction Start:** 20 Nov 1997 **Lifetime Generation:** 45684.9 GW(e).h  
**Date of First Criticality:** 01 Sep 2002 **Cumulative Energy Availability Factor:** 87.1%  
**Date of Grid Connection:** 16 Sep 2002 **Cumulative Load Factor:** 87.9%  
**Date of Commercial Operation:** 24 Dec 2002 **Cumulative Unit Capability Factor:** 87.3%  
**Cumulative Energy Unavailability Factor:** 12.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2002			Data not provided							
2003	7652.2	950.0	88.2	88.2	88.2	88.2	92.0	92.0	7728	88.2
2004	6354.5	950.0	72.8	80.5	72.8	80.5	76.1	84.0	6449	73.4
2005	7137.1	950.0	89.1	83.4	88.8	83.2	85.8	84.6	7906	90.3
2006	7988.6	993.0	91.5	85.5	91.5	85.4	91.8	86.5	8064	92.1
2007	7859.2	993.0	90.4	86.5	90.1	86.4	90.3	87.3	7957	90.8
2008	7914.6	996.0	91.1	87.3	90.9	87.1	90.7	87.9	8073	92.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2003 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure C. Inspection, maintenance or repair combined with refuelling 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.	670	40		935	18	0
Subtotal	670	40	0	935	18	0
Total	710			953		

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

System	2008 Hours Lost	2003 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	40	
17. Safety I&C Systems (excluding reactor I&C)		12
41. Main Generator Systems		6
Total	40	18

## LT-47 IGNALINA-2

**Operator:** INPP (IGNALINA NUCLEAR POWER PLANT)

**Contractor:** MAEP (MINATOMENERGOPROM, MINISTRY OF NUCLEAR POWER AND INDUSTRY)

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1185.0 MW(e)  
**Design Net Capacity:** 1500.0 MW(e)  
**Design Discharge Burnup:** 23000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 9140.0 GW(e).h  
**Energy Availability Factor:** 84.4%  
**Load Factor:** 88.0%  
**Operating Factor:** 86.3%  
**Energy Unavailability Factor:** 15.6%  
**Total Off-line Time:** 1202 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	931.0	870.3	926.3	877.7	914.2	885.8	832.7	15.4	216.3	910.8	850.5	909.0	9140.0
<b>EAF (%)</b>	100.0	100.0	100.0	98.8	98.8	100.0	92.5	1.8	25.5	100.0	96.8	99.7	84.4
<b>UCF (%)</b>	100.0	100.0	100.0	98.8	98.8	100.0	92.5	1.8	25.5	100.0	96.8	99.7	84.4
<b>LF (%)</b>	105.6	109.3	105.1	103.0	103.7	103.8	94.5	1.8	25.4	103.2	99.7	103.1	88.0
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	95.2	3.4	34.6	99.9	100.0	100.0	86.3
<b>EUF (%)</b>	0.0	0.0	0.0	1.2	1.2	0.0	7.5	98.2	74.5	0.0	3.2	0.3	15.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	4.5	98.2	74.5	0.0	0.0	0.0	14.8
<b>UCLF (%)</b>	0.0	0.0	0.0	1.2	1.2	0.0	3.1	0.0	0.0	0.0	3.2	0.3	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. 2008 Summary of Operation

THERMAL POWER OF THE UNIT 2 REACTOR IS SET BY DESIGN AND TECHNICAL CONDITIONS. THIS VALUE IS CONSTANTLY MAINTAINED WITH ACCURACY OF REGULATOR OPERATION +/- 1%. ELECTRICAL POWER OF UNIT 2 IS A VARIABLE QUANTITY AND IS DETERMINED BY THE LAKE WATER TEMPERATURE (BY VACUUM IN TURBINES CONDENSERS).

### 5. Historical Summary

**Date of Construction Start:** 01 Jan 1978 **Lifetime Generation:** 145168.0 GW(e).h  
**Date of First Criticality:** 01 Dec 1986 **Cumulative Energy Availability Factor:** 64.7%  
**Date of Grid Connection:** 20 Aug 1987 **Cumulative Load Factor:** 62.8%  
**Date of Commercial Operation:** 20 Aug 1987 **Cumulative Unit Capability Factor:** 74.3%  
**Cumulative Energy Unavailability Factor:** 35.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	2520.3	1316.0	100.0	100.0	100.0	100.0	52.2	52.2	2949	91.7
1988	7141.5	1380.0	69.7	78.3	69.7	78.3	58.9	57.0	6213	70.7
1989	7125.8	1380.0	71.2	75.4	58.0	69.9	58.9	57.8	6259	71.4
1990	8250.7	1380.0	68.3	73.3	68.3	69.4	68.3	60.9	7296	83.3
1991	8802.1	1380.0	73.2	73.3	73.0	70.2	72.8	63.6	7602	86.8
1992	6693.3	1380.0	71.4	72.9	71.4	70.4	55.2	62.0	5977	68.0
1993	5675.9	1185.0	49.0	69.6	38.2	66.0	54.7	61.0	5801	66.2
1994	3167.4	1185.0	76.2	70.4	30.5	61.7	30.5	57.4	4556	52.0
1995	5610.9	1185.0	75.8	71.0	54.1	60.9	54.1	57.0	6431	73.4
1996	6918.9	1185.0	75.8	71.5	66.5	61.5	66.5	57.9	6778	77.2
1997	6453.5	1185.0	77.9	72.0	77.7	62.9	62.2	58.3	6941	79.2
1998	8174.8	1185.0	89.7	73.5	78.6	64.2	78.8	60.0	7967	90.9
1999	4926.5	1185.0	73.8	73.5	47.5	62.9	47.5	59.0	6777	77.4
2000	3873.0	1185.0	77.6	73.8	37.2	61.1	37.2	57.5	4890	55.7
2001	4867.4	1185.0	68.8	73.5	46.9	60.2	46.9	56.8	4971	56.7
2002	7411.3	1185.0	78.4	73.8	70.9	60.8	71.4	57.7	6980	79.7
2003	7461.9	1185.0	74.6	73.8	71.5	61.5	71.9	58.5	7156	81.7
2004	4703.0	1185.0	48.0	72.4	48.0	60.7	45.2	57.8	4673	53.2
2005	9544.1	1185.0	89.3	73.3	89.3	62.2	91.9	59.6	7826	89.3
2006	7944.6	1185.0	73.5	73.3	73.5	62.8	76.5	60.4	7526	85.9
2007	9074.8	1185.0	83.8	73.8	83.8	63.8	87.4	61.7	7746	88.4
2008	9140.0	1185.0	84.4	74.3	84.4	64.7	88.0	62.8	7558	86.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					153	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling				167		
D. Inspection, maintenance or repair without refuelling	1190			1386		
E. Testing of plant systems or component:				1		
J. Grid limitation, failure or grid unavailability						12
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					42	101
L. Human factor related		36				91
Subtotal	1190	36	0	1554	198	204
Total		1226			1956	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		10
14. Safety Systems		14
15. Reactor Cooling Systems		60
16. Steam generation system:		8
32. Feedwater and Main Steam System		5
41. Main Generator Systems		1
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems		1
Total	0	124



## 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**  
**at the beginning of 2008:** 650.0 MW(e)  
**Design Net Capacity:** 654.0 MW(e)  
**Design Discharge Burnup:** 35000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 3797.8 GW(e).h  
**Energy Availability Factor:** 67.8%  
**Load Factor:** 66.7%  
**Operating Factor:** 70.4%  
**Energy Unavailability Factor:** 32.2%  
**Total Off-line Time:** 2591 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	475.1	445.9	474.8	429.7	469.9	377.4	459.6	352.4	0.0	0.0	0.0	313.0	3797.8
<b>EAF (%)</b>	99.6	99.8	99.4	93.7	99.8	82.7	98.5	81.8	0.0	-5.0	0.0	63.3	67.8
<b>UCF (%)</b>	99.6	99.8	99.5	93.7	99.8	82.7	99.2	87.1	0.0	-5.0	0.0	63.3	68.3
<b>LF (%)</b>	98.2	102.1	98.2	91.9	97.2	80.6	95.0	72.9	0.0	0.0	0.0	64.7	66.7
<b>OF (%)</b>	100.0	103.6	100.0	96.1	100.0	86.3	100.0	87.6	0.0	0.0	0.0	71.6	70.4
<b>EUF (%)</b>	0.4	0.2	0.6	6.3	0.2	17.3	1.5	18.2	100.0	105.0	100.0	36.7	32.2
<b>PUF (%)</b>	0.4	0.2	0.0	0.3	0.2	0.3	0.7	3.7	100.0	64.4	0.0	6.9	14.8
<b>UCLF (%)</b>	0.0	0.1	0.6	6.0	0.0	17.0	0.1	9.3	0.0	40.6	100.0	29.8	16.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.7	5.3	0.0	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THE LAGUNA VERDE NPP UNIT 1 STARTED THE YEAR OPERATING AT FULL RATED POWER. APRIL 13TH, 2008; 00:54 HOURS. MANUAL SCRAM DUE TO SHUTDOWN OF TWO FEED WATER PUMPS; WAS BEGINNING BY HIGH VIBRATION ON PIPE LINE CIRCULATION SYSTEM. JUNE 19TH, 2008; 01:50 HOURS. UNIT SHUTDOWN DUE TO DOESN'T MEET THE CRITERION LEAKAGE OF THE VALVE 1RCIC-AV-8146 BY TECHNICAL SPECIFICATION. LOSS EQUIVALENT TO 78,410.94 MWH. JULY 20TH, 2008; 10:00 HRS. UNIT COASTDOWN BEGINS PRIOR TO 13TH REFUELING OUTAGE. AUGUST 21TH, 2008 03:37 HRS. AUTOMATIC REACTOR SCRAM DUE TO TRIP OF MAIN TRANSFORMER BANK; THE BUSHINGS PORCELAIN WAS COMPLETELY DESTROYED, BECAUSE THE GROUND ELECTRIC ARC PASSED DIRECTLY THROUGH THE BUSHING. AUGUST 31TH, 2008; 01:00 HRS. THE 13TH REFUELING STARTED ON AUGUST 31TH, 2008, 01:00 HOURS, AND IT WAS PLANNED TO LAST FOR ABOUT 50 DAYS AND THE REAL DURATION WAS 100.75 DAYS.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Oct 1976	<b>Lifetime Generation:</b>	82288.4 GW(e).h
<b>Date of First Criticality:</b>	08 Nov 1988	<b>Cumulative Energy Availability Factor:</b>	81.0%
<b>Date of Grid Connection:</b>	13 Apr 1989	<b>Cumulative Load Factor:</b>	77.4%
<b>Date of Commercial Operation:</b>	29 Jul 1990	<b>Cumulative Unit Capability Factor:</b>	81.7%
		<b>Cumulative Energy Unavailability Factor:</b>	19.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1990	2227.9	640.0	79.7	79.7	79.7	79.7	78.8	78.8	3955	89.6
1991	4062.1	640.0	74.4	76.2	74.4	76.2	72.5	74.6	7022	80.2
1992	3746.4	654.0	70.4	73.9	70.4	73.9	65.2	70.8	7024	80.0
1993	4724.4	654.0	90.6	78.7	90.6	78.7	82.5	74.2	7851	89.6
1994	4062.0	628.0	77.8	78.5	73.8	77.6	73.8	74.1	7095	81.0
1995	4154.1	628.0	78.1	78.4	75.5	77.3	75.5	74.3	7128	81.4
1996	3442.3	655.0	68.8	76.9	68.8	75.9	59.8	72.1	6628	75.5
1997	5218.8	615.0	96.0	79.4	95.9	78.5	96.9	75.2	8577	97.9
1998	4412.5	655.0	82.2	79.7	81.7	78.9	76.9	75.4	7359	84.0
1999	4451.0	670.0	82.8	80.0	81.5	79.1	75.8	75.5	7466	85.2
2000	4577.6	645.0	80.6	80.1	80.3	79.3	80.8	76.0	7409	84.3
2001	4144.3	645.0	74.9	79.6	73.2	78.7	73.3	75.8	6808	77.7
2002	4196.3	680.0	76.4	79.4	75.8	78.5	70.4	75.3	6876	78.5
2003	5415.4	680.0	97.9	80.8	97.6	80.0	90.9	76.5	8642	98.7
2004	4168.9	680.0	75.9	80.5	75.2	79.6	69.8	76.0	6818	77.6
2005	5007.8	680.0	88.8	81.0	88.2	80.2	84.1	76.6	7884	90.0
2006	5529.7	680.0	97.5	82.1	97.5	81.3	92.8	77.6	8624	98.4
2007	5027.2	680.0	89.6	82.5	89.4	81.8	84.4	78.0	7963	90.9
2008	3797.8	650.0	68.3	81.7	67.8	81.0	66.7	77.4	6169	70.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1413		76	341	
B. Refuelling without a maintenance				35	10	
C. Inspection, maintenance or repair combined with refuelling	1200			665	27	
D. Inspection, maintenance or repair without refuelling				128		
E. Testing of plant systems or component				101	7	
J. Grid limitation, failure or grid unavailability					8	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					25	
Z. Others					27	
Subtotal	1200	1413	0	1005	445	0
Total		2613			1450	

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems	1218	25
13. Reactor Auxiliary System		146
14. Safety Systems		8
15. Reactor Cooling System	98	33
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		63
32. Feedwater and Main Steam System		78
33. Circulating Water System	27	
35. All other I&C Systems		32
42. Electrical Power Supply System	68	17
Total	1411	412

## 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  
 at the beginning of 2008: 650.0 MW(e)  
 Design Net Capacity: 654.0 MW(e)  
 Design Discharge Burnup: 35000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 5561.0 GW(e).h  
 Energy Availability Factor: 98.3%  
 Load Factor: 97.4%  
 Operating Factor: 99.4%  
 Energy Unavailability Factor: 1.7%  
 Total Off-line Time: 54 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	487.3	454.6	478.4	465.7	476.2	458.8	475.2	470.0	452.1	432.0	427.1	483.5	5561.0
EAF (%)	99.8	99.8	98.4	99.7	99.6	99.4	99.3	99.0	99.6	91.7	93.5	99.7	98.3
UCF (%)	99.8	99.8	98.4	99.7	99.6	99.4	99.3	99.0	99.6	91.7	93.5	99.7	98.3
LF (%)	100.8	100.5	98.9	99.5	98.5	98.0	98.3	97.2	96.6	89.3	91.3	100.0	97.4
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.7	96.9	100.0	99.4
EUF (%)	0.2	0.2	1.6	0.3	0.4	0.6	0.7	1.0	0.4	8.3	6.5	0.3	1.7
PUF (%)	0.2	0.1	0.7	0.3	0.4	0.6	0.3	0.8	0.2	0.8	0.4	0.3	0.4
UCLF (%)	0.0	0.0	0.9	0.0	0.0	0.0	0.4	0.2	0.1	7.5	6.1	0.0	1.3
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. 2008 Summary of Operation

THE LAGUNA VERDE NPP UNIT 2 STARTED THE YEAR OPERATING AT FULL RATED POWER.OCTOBER 28TH 2008; 21:14 HOURS, AUTOMATIC SCRAM OF THE REACTOR BY FAILURE ON POWER ELECTRICAL SOURCE OF MONITOR SUPERVISORY AT FEED WATER PUMPS B.NOVEMBER 1TH, 2008; 12:21 HOURS. MANUAL SCRAMS OF THE REACTOR BY LOW VACUUM ON THE MAIN CONDENSER.

### 5. Historical Summary

Date of Construction Start: 01 Jun 1977      Lifetime Generation: 64629.1 GW(e).h  
 Date of First Criticality: 06 Sep 1994      Cumulative Energy Availability Factor: 84.6%  
 Date of Grid Connection: 11 Nov 1994      Cumulative Load Factor: 80.6%  
 Date of Commercial Operation: 10 Apr 1995      Cumulative Unit Capability Factor: 85.3%  
    Cumulative Energy Unavailability Factor: 15.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1995	3379.4	628.0	85.9	85.9	84.5	84.5	84.5	84.5	5687	89.3
1996	3668.4	619.0	71.7	77.7	71.0	76.7	67.5	74.7	6657	75.8
1997	4805.5	627.0	89.0	81.9	88.9	81.2	87.5	79.4	7897	90.1
1998	4411.9	655.0	85.6	82.9	83.0	81.7	76.9	78.7	7609	86.9
1999	5110.6	668.0	93.3	85.2	92.3	84.0	87.3	80.6	8459	96.6
2000	3339.1	645.0	58.6	80.5	56.6	79.2	58.9	76.8	5865	66.8
2001	4228.1	645.0	74.8	79.6	74.7	78.5	74.8	76.5	6952	79.4
2002	5161.0	680.0	91.5	81.3	91.5	80.3	86.6	77.9	8273	94.4
2003	4604.8	680.0	82.5	81.4	82.1	80.5	77.3	77.8	7359	84.0
2004	4578.2	680.0	83.8	81.7	83.0	80.8	76.6	77.7	7449	84.8
2005	5310.3	680.0	96.9	83.1	96.5	82.3	89.1	78.8	8611	98.3
2006	4870.2	680.0	90.3	83.8	90.2	83.0	81.8	79.0	8003	91.4
2007	4920.2	680.0	90.1	84.3	89.9	83.6	82.6	79.3	8013	91.5
2008	5561.0	650.0	98.3	85.3	98.3	84.6	97.4	80.6	8730	99.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1995 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		154			182	
B. Refuelling without a maintenance				45	3	
C. Inspection, maintenance or repair combined with refuelling				680		
D. Inspection, maintenance or repair without refuelling				22		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					79	
Z. Others					6	
Subtotal	0	154	0	747	270	0
Total		154			1017	

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

System	2008 Hours Lost	1995 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		20
13. Reactor Auxiliary System:		12
14. Safety Systems		3
15. Reactor Cooling System:		1
16. Steam generation system:		4
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System	154	21
33. Circulating Water System		11
35. All other I&C Systems		1
41. Main Generator System:		26
42. Electrical Power Supply System:		29
Total	154	171

## 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**  
**at the beginning of 2008:** 482.0 MW(e)  
**Design Net Capacity:** 450.0 MW(e)  
**Design Discharge Burnup:** 39000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 3933.6 GW(e).h  
**Energy Availability Factor:** 92.6%  
**Load Factor:** 92.9%  
**Operating Factor:** 92.9%  
**Energy Unavailability Factor:** 7.4%  
**Total Off-line Time:** 624 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	361.9	338.4	360.6	125.2	274.8	344.7	354.5	353.4	344.7	360.6	351.3	363.3	3933.6
<b>EAF (%)</b>	99.8	99.8	99.8	35.4	76.4	99.9	99.9	99.9	99.7	99.9	99.9	99.5	92.6
<b>UCF (%)</b>	99.8	99.8	99.8	35.4	76.4	99.9	99.9	99.9	99.7	100.0	99.9	99.5	92.6
<b>LF (%)</b>	100.9	100.9	100.6	36.1	76.6	99.3	98.9	98.5	99.3	100.4	101.2	101.3	92.9
<b>OF (%)</b>	100.0	100.0	99.9	36.7	77.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.9
<b>EUF (%)</b>	0.2	0.2	0.2	64.6	23.6	0.1	0.1	0.1	0.3	0.1	0.1	0.5	7.4
<b>PUF (%)</b>	0.0	0.0	0.0	40.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
<b>UCLF (%)</b>	0.2	0.2	0.2	24.4	23.6	0.1	0.1	0.1	0.3	0.0	0.1	0.5	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jul 1969	<b>Lifetime Generation:</b>	116341.1 GW(e).h
<b>Date of First Criticality:</b>	20 Jun 1973	<b>Cumulative Energy Availability Factor:</b>	84.4%
<b>Date of Grid Connection:</b>	04 Jul 1973	<b>Cumulative Load Factor:</b>	83.3%
<b>Date of Commercial Operation:</b>	26 Oct 1973	<b>Cumulative Unit Capability Factor:</b>	84.8%
		<b>Cumulative Energy Unavailability Factor:</b>	15.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	485.9	448.0	49.2	49.2	49.2	49.2	49.2	49.2	1103	50.0
1974	2993.7	477.0	71.6	67.4	71.6	67.4	71.6	67.4	6840	78.1
1975	2776.9	447.0	70.8	68.9	70.8	68.9	70.9	68.9	6494	74.1
1976	3274.4	450.0	82.8	73.1	82.8	73.1	82.8	73.1	7521	85.6
1977	3142.4	450.0	80.4	74.8	80.4	74.8	79.7	74.7	7318	83.5
1978	3424.1	445.0	88.4	77.3	88.4	77.3	87.8	77.1	7997	91.3
1979	2900.0	445.0	83.5	78.3	83.5	78.3	74.4	76.7	6785	77.5
1980	3593.0	447.0	92.9	80.3	92.9	80.3	91.5	78.7	8496	96.7
1981	3048.3	447.0	78.8	80.1	78.8	80.1	77.8	78.6	7094	81.0
1982	3315.9	452.0	83.9	80.5	83.9	80.5	83.7	79.2	7489	85.5
1983	3050.0	452.0	76.9	80.2	76.9	80.2	77.0	79.0	6959	79.4
1984	3062.0	452.0	76.6	79.8	76.6	79.8	77.1	78.8	6895	78.5
1985	3261.2	452.0	83.3	80.1	81.9	80.0	82.4	79.1	7299	83.3
1986	3574.0	452.0	91.6	81.0	89.9	80.8	90.3	79.9	8053	91.9
1987	2950.9	452.0	76.6	80.7	74.2	80.3	74.5	79.6	6756	77.1
1988	3032.6	452.0	76.2	80.4	76.2	80.0	76.4	79.3	6763	77.0
1989	3421.9	481.0	87.8	80.9	87.8	80.5	81.2	79.5	7711	88.0
1990	2885.9	481.0	75.6	80.6	75.6	80.2	68.5	78.8	6636	75.8
1991	2728.5	452.0	69.3	79.9	69.2	79.6	68.9	78.3	6221	71.0
1992	2830.3	452.0	82.9	80.1	80.6	79.7	71.3	77.9	6412	73.0
1993	3328.2	452.0	84.3	80.3	83.6	79.9	84.1	78.2	7376	84.2
1994	3322.0	452.0	84.8	80.5	84.1	80.1	83.9	78.5	7489	85.5
1995	3386.8	452.0	87.1	80.8	86.8	80.4	85.5	78.8	7654	87.4
1996	3520.3	452.0	88.3	81.1	88.2	80.7	88.7	79.2	7978	90.8
1997	Data not provided									
1998	"									
1999	3604.2	449.0	94.2	81.7	94.2	81.3	91.6	79.7	8363	95.5
2000	3699.0	449.0	93.9	82.1	93.1	81.7	93.8	80.3	8262	94.1
2001	3746.7	449.0	94.6	82.6	94.6	82.2	95.3	80.8	8404	95.9
2002	3686.9	450.0	93.8	83.0	93.4	82.6	93.5	81.3	8284	94.6
2003	3788.3	450.0	95.3	83.4	95.3	83.1	96.1	81.8	8431	96.2
2004	3604.7	450.0	91.1	83.7	91.1	83.3	91.2	82.1	8073	91.9
2005	3771.9	450.0	95.9	84.1	95.5	83.7	95.7	82.6	8430	96.2
2006	3272.6	450.0	85.7	84.2	84.6	83.8	82.5	82.6	7542	86.1
2007	3993.9	482.0	95.2	84.5	95.1	84.1	94.6	83.0	8346	95.3
2008	3933.6	482.0	92.6	84.8	92.6	84.4	92.9	83.3	8161	92.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1973 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					143	
B. Refuelling without a maintenance				29	1	
C. Inspection, maintenance or repair combined with refuelling				721	17	
D. Inspection, maintenance or repair without refuelling				48		
E. Testing of plant systems or component					15	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				28		
J. Grid limitation, failure or grid unavailability					1	3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	3	5
Subtotal	0	0	0	826	180	8
Total	0			1014		

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

System	2008 Hours Lost	1973 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		4
13. Reactor Auxiliary System		4
14. Safety Systems		13
15. Reactor Cooling System		18
16. Steam generation system		38
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		31
33. Circulating Water System		2
41. Main Generator System		0
42. Electrical Power Supply System		11
XX. Miscellaneous Systems		1
Total	0	140

# 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 1356.5 GW(e).h  
**Energy Availability Factor:** 52.3%  
**Load Factor:** 51.5%  
**Operating Factor:** 54.6%  
**Energy Unavailability Factor:** 47.7%  
**Total Off-line Time:** 3989 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	152.8	191.7	205.9	215.1	196.5	212.0	171.9	10.6	0.0	0.0	0.0	0.0	1356.5
<b>EAF (%)</b>	68.3	91.1	92.6	99.3	98.0	98.5	76.7	4.7	0.0	0.0	0.0	0.0	52.3
<b>UCF (%)</b>	68.3	91.1	92.7	99.8	98.0	99.7	76.8	4.7	0.0	0.0	0.0	0.0	52.4
<b>LF (%)</b>	68.5	91.8	92.3	99.6	88.0	98.1	77.0	4.7	0.0	0.0	0.0	0.0	51.5
<b>OF (%)</b>	68.1	92.8	94.5	100.0	94.0	100.0	100.0	7.5	0.0	0.0	0.0	0.0	54.6
<b>EUF (%)</b>	31.7	8.9	7.4	0.7	2.0	1.5	23.3	95.3	100.0	100.0	100.0	100.0	47.7
<b>PUF (%)</b>	31.7	5.1	2.0	0.2	0.2	0.3	23.2	95.3	100.0	100.0	100.0	100.0	46.7
<b>UCLF (%)</b>	0.0	3.8	5.4	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.5	0.1	1.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

PLANNED OUTAGE IN JANUARY 2008 FOR MECHANICAL SEAL REPLACEMENT OF REACTOR COOLANT PUMP-A.  
 REFUELING OUTAGE AND MODIFICATION OF IRRADIATION SURVEILLANCE CAPSULE (ISC) ASSEMBLY AND ITS  
 SUPPORT STRUCTURE CONTINUED TILL END OF THE YEAR.

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1993 **Lifetime Generation:** 15218.3 GW(e).h  
**Date of First Criticality:** 03 May 2000 **Cumulative Energy Availability Factor:** 69.5%  
**Date of Grid Connection:** 13 Jun 2000 **Cumulative Load Factor:** 68.9%  
**Date of Commercial Operation:** 15 Sep 2000 **Cumulative Unit Capability Factor:** 70.2%  
**Cumulative Energy Unavailability Factor:** 30.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2000	529.2	300.0	72.2	72.2	72.2	72.2	68.7	68.7	1860	72.4
2001	1581.8	300.0	62.4	64.7	60.1	62.8	60.2	62.1	5918	67.6
2002	1356.0	300.0	53.7	59.9	52.2	58.2	51.6	57.5	4790	54.7
2003	1809.8	300.0	68.9	62.6	68.9	61.4	68.9	61.0	6879	78.5
2004	1750.7	300.0	68.1	63.9	66.4	62.6	66.4	62.2	5949	67.7
2005	2155.2	300.0	81.9	67.3	81.9	66.2	82.0	66.0	7458	85.1
2006	2532.9	300.0	98.2	72.2	98.2	71.3	96.4	70.8	8569	97.8
2007	1949.1	300.0	75.6	72.7	75.2	71.8	74.2	71.3	6669	76.1
2008	1356.5	300.0	52.4	70.2	52.3	69.5	51.5	68.9	4795	54.6



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2000 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		57			699	
C. Inspection, maintenance or repair combined with refuelling	3616			707		
D. Inspection, maintenance or repair without refuelling	241			64		
E. Testing of plant systems or component:				8	3	
H. Nuclear regulatory requirement				60		
J. Grid limitation, failure or grid unavailability			74		6	148
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.						34
Z. Others					52	
Subtotal	3857	57	74	839	772	182
Total		3988			1793	

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

System	2008 Hours Lost	2000 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		52
12. Reactor I&C Systems		26
14. Safety Systems		93
15. Reactor Cooling System	36	160
16. Steam generation system		3
31. Turbine and auxiliaries		80
32. Feedwater and Main Steam System		49
33. Circulating Water System		11
35. All other I&C Systems		5
41. Main Generator System		0
42. Electrical Power Supply System	20	213
Total	56	692

## PK-1 KANUPP

**Operator:** PAEC (PAKISTAN ATOMIC ENERGY COMMISSION)

**Contractor:** CGE (CANADIAN GENERAL ELECTRIC)

### 1. Station Details

**Type:** PHWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 125.0 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 2008

**Net Energy Production:** 384.8 GW(e).h  
**Energy Availability Factor:** 63.3%  
**Load Factor:** 35.1%  
**Operating Factor:** 57.4%  
**Energy Unavailability Factor:** 36.7%  
**Total Off-line Time:** 3734 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	15.8	21.1	53.0	32.5	33.2	7.2	17.5	34.9	37.0	40.4	41.7	50.6	384.8
<b>EAF (%)</b>	89.1	84.5	68.1	69.0	73.0	64.3	30.1	46.5	55.6	74.5	51.7	54.5	63.3
<b>UCF (%)</b>	89.1	84.5	68.1	69.0	73.0	64.3	30.1	46.5	55.6	74.5	51.7	54.5	63.3
<b>LF (%)</b>	17.0	25.1	57.0	36.2	35.7	8.0	18.8	37.5	41.1	43.4	46.3	54.4	35.1
<b>OF (%)</b>	28.0	40.6	89.0	67.2	62.6	13.8	31.7	60.3	66.3	68.9	74.3	84.0	57.4
<b>EUF (%)</b>	10.9	15.5	31.9	31.0	27.0	35.7	69.9	53.5	44.4	25.5	48.3	45.5	36.7
<b>PUF (%)</b>	10.9	15.5	31.9	31.0	27.0	5.7	12.9	22.8	25.1	25.5	28.0	29.7	22.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	30.0	57.0	30.7	19.3	0.0	20.3	15.9	14.5
<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. 2008 Summary of Operation

KANUPP OPERATED AT A LOAD OF 85-90 MWE DURING 2008. IT GENERATED 384.8 GWE.H WITH OPERATION FACTOR OF 57%. NEA DATA NOT AVAILABLE SINCE THE NUCLEAR DESALINATION PROJECT AT KANUPP IS EXPECTED TO BE OPERATIONAL IN MID 2009.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Aug 1966	<b>Lifetime Generation:</b>	10735.0 GW(e).h
<b>Date of First Criticality:</b>	01 Aug 1971	<b>Cumulative Energy Availability Factor:</b>	29.1%
<b>Date of Grid Connection:</b>	18 Oct 1971	<b>Cumulative Load Factor:</b>	27.0%
<b>Date of Commercial Operation:</b>	07 Dec 1972	<b>Cumulative Unit Capability Factor:</b>	30.2%
		<b>Cumulative Energy Unavailability Factor:</b>	70.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	39.4	137.0	38.7	38.7	38.7	38.7	38.7	38.7	597	80.2
1973	394.8	126.0	42.6	42.2	35.6	35.9	35.8	36.0	6197	70.7
1974	583.9	126.0	52.7	47.3	52.7	43.9	52.9	44.1	6749	77.0
1975	494.9	126.0	44.8	46.5	44.8	44.2	44.8	44.3	6375	72.8
1976	487.3	137.0	40.5	44.9	40.5	43.3	40.5	43.3	6026	68.6
1977	339.4	126.0	30.7	42.2	30.7	40.8	30.7	40.9	5290	60.4
1978	228.4	125.0	20.9	38.8	20.9	37.6	20.9	37.7	4473	51.1
1979	29.6	125.0	2.7	33.8	2.7	32.8	2.7	32.8	802	9.2
1980	67.9	125.0	6.2	30.4	6.2	29.6	6.2	29.6	2427	27.6
1981	192.2	125.0	17.5	29.0	17.5	28.3	17.6	28.3	5379	61.4
1982	70.9	125.0	6.5	26.8	6.5	26.1	6.5	26.2	1801	20.6
1983	194.0	125.0	17.7	26.0	17.7	25.4	17.7	25.4	4754	54.3
1984	290.7	137.0	26.9	26.1	24.9	25.3	24.2	25.3	5592	63.7
1985	262.0	137.0	22.7	25.8	21.8	25.0	21.8	25.0	3895	44.5
1986	476.2	125.0	44.0	27.1	43.5	26.3	43.5	26.3	7211	82.3
1987	274.8	125.0	25.6	27.0	25.1	26.2	25.1	26.2	4541	51.8
1988	171.4	125.0	16.2	26.3	15.6	25.6	15.6	25.6	2962	33.7
1989	60.9	125.0	5.6	25.1	5.6	24.4	5.6	24.4	1145	13.1
1990	375.9	125.0	34.3	25.6	34.3	25.0	34.3	25.0	5331	60.9
1991	370.3	125.0	34.8	26.1	33.8	25.4	33.8	25.4	6126	69.9
1992	499.7	125.0	45.5	27.0	45.5	26.4	45.5	26.4	6396	72.8
1993	369.6	125.0	35.8	27.5	33.8	26.8	33.8	26.7	4620	52.7
1994	523.6	125.0	53.6	28.6	47.8	27.7	47.8	27.7	7518	85.8
1995	461.0	125.0	44.0	29.3	42.1	28.3	42.1	28.3	7520	85.8
1996	310.9	125.0	32.6	29.4	28.3	28.3	28.3	28.3	5291	60.2
1997	386.1	125.0	36.8	29.7	35.3	28.6	35.3	28.6	6391	73.0
1998	353.4	125.0	31.3	29.8	29.7	28.6	32.3	28.7	4799	54.8
1999	69.0	125.0	11.9	29.1	11.9	28.0	6.3	27.9	1046	11.9
2000	368.3	125.0	34.6	29.3	33.5	28.2	33.5	28.1	5078	57.8
2001	399.5	125.0	45.1	29.8	36.5	28.5	36.5	28.4	6049	69.1
2002	444.0	125.0	41.3	30.2	40.5	28.9	40.5	28.8	6601	75.4
2003	0.0	125.0	0.0	29.3	0.0	28.0	0.0	27.9	0	0.0
2004	183.0	125.0	25.5	29.1	24.7	27.9	16.7	27.5	6467	73.6
2005	253.6	125.0	37.7	29.4	37.7	28.2	23.2	27.4	6633	75.7
2006	15.0	125.0	4.6	28.7	4.6	27.5	1.4	26.6	408	4.7
2007	359.5	125.0	50.9	29.3	50.9	28.1	32.8	26.8	5989	68.4
2008	384.8	125.0	63.3	30.2	63.3	29.1	35.1	27.0	5026	57.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1271			1088	
B. Refuelling without a maintenance outage					62	
C. Inspection, maintenance or repair combined with refuelling	212					
D. Inspection, maintenance or repair without refuelling	1537					
E. Testing of plant systems or component	0					
G. Major back-fitting, refurbishment or upgrading activities without refuelling	285					
J. Grid limitation, failure or grid unavailability			2486			172
K. Load-following (frequency control reserve shutdown due to reduced energy demand)	4				101	12
Subtotal	0	1271	2486	2038	1251	184
Total		3757			3473	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	198	11
12. Reactor I&C Systems		115
13. Reactor Auxiliary Systems	264	112
14. Safety Systems		16
15. Reactor Cooling Systems		181
16. Steam generation system	774	45
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		41
31. Turbine and auxiliaries	35	25
32. Feedwater and Main Steam System		187
33. Circulating Water System		30
41. Main Generator Systems		5
42. Electrical Power Supply System		129
XX. Miscellaneous Systems		4
Total	1271	901

# 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 at the beginning of 2008:** 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 2008

**Net Energy Production:** 4805.5 GW(e).h  
**Energy Availability Factor:** 83.7%  
**Load Factor:** 84.4%  
**Operating Factor:** 84.6%  
**Energy Unavailability Factor:** 16.3%  
**Total Off-line Time:** 1349 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	483.5	454.3	486.6	433.5	139.8	0.0	419.8	475.5	465.8	488.5	470.2	487.8	4805.5
<b>EAF (%)</b>	99.9	99.9	99.9	91.8	28.7	0.0	86.9	98.5	99.3	99.9	99.9	99.9	83.7
<b>UCF (%)</b>	99.9	99.9	99.9	98.8	28.8	0.0	87.9	99.8	99.8	99.9	99.9	99.9	84.5
<b>LF (%)</b>	100.0	104.0	100.6	92.8	28.9	0.0	86.8	98.3	99.5	100.9	100.5	100.9	84.4
<b>OF (%)</b>	100.0	103.6	99.9	93.0	29.0	0.0	90.2	100.0	100.0	99.9	100.0	100.0	84.6
<b>EUF (%)</b>	0.1	0.1	0.1	8.2	71.3	100.0	13.1	1.5	0.7	0.1	0.1	0.1	16.3
<b>PUF (%)</b>	0.1	0.1	0.1	0.1	71.3	64.4	2.3	0.2	0.2	0.1	0.1	0.1	11.6
<b>UCLF (%)</b>	0.0	0.0	0.0	1.1	0.0	35.6	9.8	0.0	0.0	0.0	0.0	0.0	3.8
<b>XUF (%)</b>	0.0	0.0	0.0	7.0	0.0	0.0	1.0	1.4	0.5	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

THE UNIT WAS OPERATED AT FULL POWER IN BASE LOAD MODE.THE ANNUAL PLANED OUTAGE TOOK PLACE FOR A DURATION OF 42 DAYS SCHEDULED AND HAD AN EXTENTION OF 13.7 DAYS.THE MOST IMPORTANT PERFORMED MAINTENANCE ACTIVITIES WERE:REACTOR FUEL CHANNELS INSPECTIONS, REPLACEMENT OF MODERATOR PUMP 3211-P1SEAL;REAPACEMENT OF MODERATOR COVER GAS RECOMBINATIO UNITS;INSPECTIONS/REPAIRS TO MP TURBINE CJP-B; PREVENTIVE MAINTENANCE OF MOISTURE SEPARATOR/REHEATER; PREVENTIVE MAINTENANCE AND TESTING OF ELECTRICAL GENERATOR,ETC.AT THE BEGINING OF THE YEAR, RUP WAS CHANGED FROM 655 MW TO 650 MW ACORDING WHITH THE MANAGEMENT DECISION TO AMEND THE ORIGINAL VALUE.THIS DECISION WAS TAKEN BECAUSE OF THE NEW VALUES MEASURED AFTER REPLACEMENT OF THE ELECTRICAL ENERGY METERS.

## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1982 **Lifetime Generation:** 61360.5 GW(e).h  
**Date of First Criticality:** 16 Apr 1996 **Cumulative Energy Availability Factor:** 87.3%  
**Date of Grid Connection:** 11 Jul 1996 **Cumulative Load Factor:** 87.6%  
**Date of Commercial Operation:** 02 Dec 1996 **Cumulative Unit Capability Factor:** 88.4%  
**Cumulative Energy Unavailability Factor:** 12.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1996	461.9	647.0	94.4	94.4	94.4	94.4	99.6	99.6	719	100.0
1997	4953.3	646.0	87.3	87.9	86.7	87.3	87.5	88.4	7753	88.5
1998	4908.7	655.0	85.8	86.9	85.2	86.3	85.5	87.0	7585	86.6
1999	4813.0	654.0	83.8	85.9	83.5	85.4	83.9	86.0	7389	84.3
2000	5053.4	655.0	87.9	86.4	87.6	85.9	87.8	86.5	7791	88.7
2001	5049.9	655.0	88.2	86.7	87.5	86.2	88.0	86.8	7717	88.1
2002	5106.2	655.0	89.1	87.1	88.7	86.6	89.0	87.1	7854	89.7
2003	4541.4	655.0	86.7	87.1	78.7	85.5	79.1	86.0	7024	80.2
2004	5142.3	655.0	89.4	87.3	89.1	86.0	89.4	86.4	7892	89.8
2005	5113.0	655.0	89.6	87.6	89.3	86.3	89.1	86.7	7878	89.9
2006	5178.0	655.0	90.8	87.9	90.3	86.7	90.2	87.1	7987	91.2
2007	5518.3	655.0	97.1	88.7	96.5	87.6	96.2	87.9	8527	97.3
2008	4805.5	650.0	84.5	88.4	83.7	87.3	84.4	87.6	7411	84.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1997 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		334			223	
B. Refuelling without a maintenance					10	
D. Inspection, maintenance or repair without refuelling	992			587		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					20	3
L. Human factor related					12	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			44			53
Subtotal	992	334	44	587	265	56
Total		1370			908	

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

System	2008 Hours Lost	1997 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		53
13. Reactor Auxiliary Systems		15
14. Safety Systems		2
31. Turbine and auxiliaries	5	65
32. Feedwater and Main Steam System		26
33. Circulating Water System		0
41. Main Generator Systems	329	3
42. Electrical Power Supply Systems		8
XX. Miscellaneous Systems		29
Total	334	201

## 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  
 at the beginning of 2008: 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 2008

Net Energy Production: 5528.1 GW(e).h  
 Energy Availability Factor: 96.8%  
 Load Factor: 97.1%  
 Operating Factor: 99.0%  
 Energy Unavailability Factor: 3.2%  
 Total Off-line Time: 91 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	478.5	409.4	480.4	417.7	477.6	455.1	466.8	466.6	459.7	483.0	448.6	484.7	5528.1
EAF (%)	98.8	90.2	99.4	89.3	98.9	97.5	96.7	96.6	98.3	99.9	95.8	99.9	96.8
UCF (%)	98.8	90.3	99.4	99.7	99.7	99.6	99.9	99.9	100.0	99.9	95.8	99.9	98.6
LF (%)	98.9	93.7	99.3	89.4	98.8	97.2	96.5	96.5	98.2	99.7	95.9	100.2	97.1
OF (%)	98.8	98.8	99.9	90.4	100.0	100.0	100.0	100.0	100.0	100.0	99.4	100.0	99.0
EUf (%)	1.2	9.8	0.6	10.7	1.1	2.5	3.3	3.4	1.7	0.1	4.2	0.1	3.2
PUF (%)	0.0	0.0	0.0	0.3	0.3	0.4	0.1	0.1	0.1	0.1	0.0	0.1	0.1
UCLF (%)	1.2	9.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.0	1.2
XUF (%)	0.0	0.0	0.0	10.4	0.8	2.2	3.2	3.3	1.6	0.0	0.0	0.0	1.8

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THE UNIT WAS OPERATED AT FULL POWER IN BASE LOAD MODE.NO ANNUAL OUTAGE WAS PLANNED FOR THIS YEAR.DURING UNIT #1 OUTAGE, THE UNIT 2 HAS SUPPLIED STEAM TO THERMAL STATION FROM UNIT 1 FOR DISTRICT HEATING.

### 5. Historical Summary

Date of Construction Start: 01 Jul 1983      Lifetime Generation: 7088.3 GW(e).h  
 Date of First Criticality: 06 May 2007      Cumulative Energy Availability Factor: 96.6%  
 Date of Grid Connection: 07 Aug 2007      Cumulative Load Factor: 94.1%  
 Date of Commercial Operation: 31 Oct 2007      Cumulative Unit Capability Factor: 98.0%  
    Cumulative Energy Unavailability Factor: 3.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2007	1182.8	650.0	95.4	95.4	95.4	95.4	82.4	82.4	1846	83.6
2008	5528.1	650.0	98.6	98.0	96.8	96.6	97.1	94.1	8669	99.0

### 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2007 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure N. Environmental conditions (lack of cooling water due to dry weather cooling water temperature limits flood, storm, lightning, etc.		45	70		42	
Subtotal	0	45	70	0	42	0
Total		115			42	

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

System	2008 Hours Lost	2007 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		21
31. Turbine and auxiliaries	41	
41. Main Generator Systems	4	21
Total	45	42

## RU-96 BALAKOVO-1

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6810.2 GW(e).h  
**Energy Availability Factor:** 81.7%  
**Load Factor:** 81.8%  
**Operating Factor:** 83.1%  
**Energy Unavailability Factor:** 18.3%  
**Total Off-line Time:** 1477 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	716.2	690.4	675.7	712.6	725.8	696.1	703.9	669.7	30.3	0.0	569.4	620.0	6810.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	99.0	94.1	5.6	0.0	82.1	100.0	81.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	6.8	0.0	82.1	100.0	82.4
<b>LF (%)</b>	101.3	108.1	95.6	104.3	102.7	101.8	99.6	94.8	4.4	0.0	83.2	87.7	81.8
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	6.9	0.0	88.1	100.0	83.1
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.0	5.9	94.4	100.0	17.9	0.0	18.3
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	93.2	100.0	17.9	0.0	17.6
<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	1.0	5.9	1.2	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2008 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, NOVEMBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 125322 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 08.09.03 TO 08.11.04. 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

<b>Date of Construction Start:</b>	01 Dec 1980	<b>Lifetime Generation:</b>	122422.0 GW(e).h
<b>Date of First Criticality:</b>	12 Dec 1985	<b>Cumulative Energy Availability Factor:</b>	66.9%
<b>Date of Grid Connection:</b>	28 Dec 1985	<b>Cumulative Load Factor:</b>	64.2%
<b>Date of Commercial Operation:</b>	23 May 1986	<b>Cumulative Unit Capability Factor:</b>	69.5%
		<b>Cumulative Energy Unavailability Factor:</b>	33.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	3675.6	950.0	66.3	66.3	66.3	66.3	65.8	65.8	4171	70.9
1987	4703.7	1000.0	57.4	60.8	57.4	60.8	53.7	58.4	5302	60.5
1988	6476.9	950.0	80.9	68.2	80.9	68.2	77.6	65.5	7207	82.0
1989	4473.9	950.0	56.4	65.0	56.3	65.0	53.8	62.3	5141	58.7
1990	739.1	950.0	9.1	53.2	9.1	53.2	8.9	51.0	887	10.1
1991	4951.6	950.0	60.2	54.4	59.8	54.4	59.5	52.5	5780	66.0
1992	6352.3	950.0	76.4	57.7	76.3	57.6	76.1	56.0	7666	87.3
1993	3326.1	950.0	46.1	56.2	39.9	55.3	40.0	53.9	4230	48.3
1994	1759.5	950.0	77.3	58.6	77.3	57.9	21.1	50.2	2307	26.3
1995	2018.0	950.0	28.6	55.5	28.6	54.8	24.2	47.5	4810	54.9
1996	4872.5	950.0	86.5	58.4	59.0	55.2	58.4	48.5	5913	67.3
1997	4729.0	950.0	60.4	58.6	57.2	55.4	56.8	49.2	5818	66.4
1998	4329.8	950.0	55.8	58.4	52.2	55.1	52.0	49.5	5671	64.7
1999	5141.3	950.0	65.6	58.9	62.1	55.7	61.8	50.4	6337	72.3
2000	7247.4	950.0	87.5	60.8	86.5	57.8	86.8	52.8	7705	87.7
2001	7407.9	950.0	91.6	62.8	88.2	59.7	89.0	55.1	8041	91.8
2002	6785.7	950.0	86.5	64.2	80.5	60.9	81.5	56.7	7501	85.6
2003	7032.2	950.0	84.7	65.4	83.1	62.2	84.5	58.3	7460	85.2
2004	6626.4	950.0	78.2	66.1	78.0	63.0	79.4	59.4	6901	78.6
2005	7312.7	950.0	86.6	67.1	86.2	64.2	87.9	60.9	7638	87.2
2006	7277.0	950.0	85.5	68.0	85.2	65.2	87.4	62.1	7517	85.8
2007	7397.3	950.0	88.0	68.9	86.5	66.2	88.9	63.4	7731	88.3
2008	6810.2	950.0	82.4	69.5	81.7	66.9	81.8	64.2	7283	83.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					432	
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling	1501			1310	16	
D. Inspection, maintenance or repair without refuelling				398		
E. Testing of plant systems or component				1	1	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						106
J. Grid limitation, failure or grid unavailability						209
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					34	1
L. Human factor related					0	
Subtotal	1501	0	0	1709	494	316
Total	1501			2519		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		2
15. Reactor Cooling Systems		10
16. Steam generation system		120
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries		65
32. Feedwater and Main Steam System		14
33. Circulating Water System		1
35. All other I&C Systems		11
41. Main Generator Systems		127
42. Electrical Power Supply Systems		29
XX. Miscellaneous Systems		2
Total	0	388

## RU-97 BALAKOVO-2

Operator: EA (JSC "Concern Energoatom")

Contractor: FAEA (Federal Atomic Energy Agency)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 7451.2 GW(e).h  
 Energy Availability Factor: 87.7%  
 Load Factor: 89.5%  
 Operating Factor: 88.5%  
 Energy Unavailability Factor: 12.3%  
 Total Off-line Time: 1010 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	700.3	691.9	757.0	703.3	704.2	694.5	443.6	19.2	658.6	763.7	690.4	624.7	7451.2
EAF (%)	100.0	100.0	100.0	99.7	100.0	100.0	62.9	4.2	90.7	99.6	97.6	99.7	87.7
UCF (%)	100.0	100.0	100.0	99.8	100.0	100.0	64.1	4.3	90.7	99.6	97.7	99.7	87.8
LF (%)	99.1	108.4	107.1	103.0	99.6	101.5	62.8	2.7	96.3	107.9	100.9	88.4	89.5
OF (%)	100.0	103.6	99.9	100.1	100.0	100.0	64.2	6.0	92.2	100.0	98.2	100.0	88.5
EUF (%)	0.0	0.0	0.0	0.3	0.0	0.0	37.1	95.8	9.3	0.4	2.4	0.3	12.3
PUF (%)	0.0	0.0	0.0	0.3	0.0	0.0	35.9	93.3	1.4	0.4	0.0	0.0	11.1
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	8.0	0.0	2.4	0.3	1.1
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 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 267280 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.07.20 TO 08.08.29. 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 Aug 1981      Lifetime Generation: 113216.0 GW(e).h  
 Date of First Criticality: 02 Oct 1987      Cumulative Energy Availability Factor: 65.4%  
 Date of Grid Connection: 08 Oct 1987      Cumulative Load Factor: 64.2%  
 Date of Commercial Operation: 18 Jan 1988      Cumulative Unit Capability Factor: 69.0%  
    Cumulative Energy Unavailability Factor: 34.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	5978.4	950.0	76.9	76.9	76.9	76.9	71.6	71.6	6928	78.9
1989	6703.6	950.0	84.8	80.9	84.8	80.8	80.6	76.1	7626	87.1
1990	5476.7	950.0	66.5	76.1	66.3	76.0	65.8	72.7	6165	70.4
1991	4308.4	950.0	51.5	69.9	51.2	69.8	51.8	67.4	4845	55.3
1992	5958.2	950.0	70.6	70.1	70.6	70.0	71.4	68.2	6601	75.1
1993	3776.2	950.0	47.0	66.2	44.3	65.7	45.4	64.4	4147	47.3
1994	4778.5	950.0	83.5	68.7	73.1	66.7	57.4	63.4	8020	91.6
1995	2204.8	950.0	30.1	63.9	30.1	62.2	26.5	58.8	3261	37.2
1996	2227.3	950.0	26.7	59.7	26.7	58.2	26.7	55.2	2604	29.6
1997	4015.9	950.0	63.9	60.2	55.7	58.0	48.3	54.5	6158	70.3
1998	3293.8	950.0	51.0	59.3	40.2	56.4	39.6	53.2	4984	56.9
1999	2927.1	950.0	40.3	57.7	35.4	54.6	35.2	51.7	3942	45.0
2000	5730.1	950.0	83.2	59.7	68.9	55.7	68.7	53.0	7646	87.0
2001	6678.8	950.0	83.9	61.4	79.9	57.4	80.3	54.9	7415	84.6
2002	6756.5	950.0	84.4	63.0	80.4	59.0	81.2	56.7	7408	84.6
2003	6171.8	950.0	74.0	63.7	72.7	59.8	74.2	57.8	6467	73.8
2004	7010.4	950.0	85.0	64.9	82.4	61.2	84.0	59.3	7514	85.5
2005	6948.9	950.0	86.9	66.1	82.5	62.3	83.5	60.7	7688	87.8
2006	7237.5	950.0	87.4	67.2	84.6	63.5	87.0	62.0	7710	88.0
2007	6657.2	950.0	83.5	68.1	78.7	64.3	80.0	62.9	7327	83.6
2008	7451.2	950.0	87.8	69.0	87.7	65.4	89.5	64.2	7750	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		87			455	
B. Refuelling without a maintenance outage					5	
C. Inspection, maintenance or repair combined with refuelling	947			1654	130	
D. Inspection, maintenance or repair without refuelling				142		
J. Grid limitation, failure or grid unavailability						9
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					20	
Subtotal	947	87	0	1796	610	9
Total	1034			2415		

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	52	8
15. Reactor Cooling System:		10
16. Steam generation system:		379
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System	13	23
35. All other I&C Systems		4
41. Main Generator System:	22	23
42. Electrical Power Supply System:		1
Total	87	452

## RU-98 BALAKOVO-3

Operator: EA (JSC "Concern Energoatom")

Contractor: FAEA (Federal Atomic Energy Agency)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 7384.3 GW(e).h  
 Energy Availability Factor: 87.0%  
 Load Factor: 88.7%  
 Operating Factor: 87.8%  
 Energy Unavailability Factor: 13.0%  
 Total Off-line Time: 1067 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	558.5	0.0	533.7	707.5	721.5	693.8	605.5	708.7	710.1	730.0	718.9	696.2	7384.3
EAF (%)	78.8	-3.6	78.1	100.0	100.0	100.0	85.8	98.6	100.0	98.6	100.0	100.0	87.0
UCF (%)	80.1	-3.6	78.1	100.0	100.0	100.0	86.4	98.6	100.0	98.7	100.0	100.0	87.1
LF (%)	79.0	0.0	75.5	103.6	102.1	101.4	85.7	100.3	103.8	103.1	105.1	98.5	88.7
OF (%)	80.1	0.0	78.0	100.1	100.0	100.0	88.7	100.0	100.0	100.0	100.0	100.0	87.8
EUF (%)	21.2	103.6	21.9	0.0	0.0	0.0	14.2	1.4	0.0	1.4	0.0	0.0	13.0
PUF (%)	19.9	103.6	21.9	0.0	0.0	0.0	2.3	1.4	0.0	1.4	0.0	0.0	11.9
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	11.4	0.0	0.0	0.0	0.0	0.0	1.0
XUF (%)	1.3	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 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 - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 135907 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.01.21 TO 08.03.07. 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 Nov 1982      Lifetime Generation: 114379.0 GW(e).h  
 Date of First Criticality: 16 Dec 1988      Cumulative Energy Availability Factor: 70.6%  
 Date of Grid Connection: 25 Dec 1988      Cumulative Load Factor: 68.8%  
 Date of Commercial Operation: 08 Apr 1989      Cumulative Unit Capability Factor: 75.2%  
    Cumulative Energy Unavailability Factor: 29.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	5483.4	950.0	88.4	88.4	88.4	88.4	87.4	87.4	6015	91.1
1990	5718.7	950.0	68.0	76.8	67.8	76.7	68.7	76.8	6696	76.4
1991	5403.4	950.0	67.1	73.3	64.2	72.1	64.9	72.5	6124	69.9
1992	5545.4	950.0	66.4	71.4	64.8	70.2	66.4	70.9	6202	70.6
1993	4378.6	950.0	61.6	69.4	52.7	66.5	52.6	67.0	5461	62.3
1994	3340.1	950.0	70.7	69.6	70.7	67.2	40.1	62.4	5389	61.5
1995	2674.7	950.0	53.1	67.2	47.5	64.3	32.1	57.9	5511	62.9
1996	5315.4	950.0	75.9	68.3	64.3	64.3	63.7	58.6	7085	80.7
1997	2058.8	950.0	38.8	64.9	25.3	59.9	24.7	54.8	3395	38.8
1998	5348.5	950.0	73.0	65.8	64.4	60.3	64.3	55.7	7136	81.5
1999	5458.0	950.0	72.0	66.3	65.6	60.8	65.6	56.7	6552	74.8
2000	6482.9	950.0	82.0	67.7	77.2	62.2	77.7	58.4	7327	83.4
2001	6050.7	950.0	78.6	68.5	72.1	63.0	72.7	59.6	6927	79.1
2002	6926.3	950.0	85.3	69.8	82.0	64.4	83.2	61.3	7478	85.4
2003	7016.1	950.0	85.1	70.8	83.2	65.6	84.3	62.8	7471	85.3
2004	7227.8	950.0	86.4	71.8	85.1	66.9	86.6	64.4	7607	86.6
2005	6244.4	950.0	79.9	72.3	74.5	67.3	75.0	65.0	7060	80.6
2006	7741.8	950.0	95.3	73.6	91.4	68.7	93.0	66.6	8354	95.4
2007	7407.1	950.0	91.8	74.5	87.6	69.7	89.0	67.8	8050	91.9
2008	7384.3	950.0	87.1	75.2	87.0	70.6	88.7	68.8	7693	87.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		84			103	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	1007			1429	33	
D. Inspection, maintenance or repair without refuelling				268		
E. Testing of plant systems or component:					1	
J. Grid limitation, failure or grid unavailability						73
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	
Subtotal	1007	84	0	1697	148	73
Total	1091			1918		

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	84	32
13. Reactor Auxiliary System:		0
15. Reactor Cooling System:		1
31. Turbine and auxiliaries		11
32. Feedwater and Main Steam System		7
33. Circulating Water System		9
35. All other I&C Systems		6
41. Main Generator System:		6
42. Electrical Power Supply System:		16
Total	84	88

## RU-99 BALAKOVO-4

Operator: EA (JSC "Concern Energoatom")

Contractor: FAEA (Federal Atomic Energy Agency)

### 1. Station Details

Type: PWR

Net Reference Unit Power at the beginning of 2008: 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 2008

Net Energy Production: 8330.4 GW(e).h

Energy Availability Factor: 99.7%

Load Factor: 100.1%

Operating Factor: 100.2%

Energy Unavailability Factor: 0.3%

Total Off-line Time: -19 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	702.7	696.7	622.8	656.6	704.2	702.5	714.3	722.4	709.2	730.6	677.9	690.5	8330.4
EAF (%)	98.3	100.0	100.0	100.0	99.2	100.0	99.8	100.0	100.0	99.3	100.0	100.0	99.7
UCF (%)	98.3	100.0	100.0	100.0	99.2	100.0	100.0	100.0	100.0	99.3	100.0	100.0	99.7
LF (%)	99.4	109.1	88.1	96.1	99.6	102.7	101.1	102.2	103.7	103.2	99.1	97.7	100.1
OF (%)	100.0	103.6	99.9	99.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.2
EUF (%)	1.7	0.0	0.0	0.0	0.8	0.0	0.2	0.0	0.0	0.7	0.0	0.0	0.3
PUF (%)	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.1
UCLF (%)	1.7	0.0	0.0	0.0	0.0	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	0.2	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 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 173756 MWH. 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      Lifetime Generation: 96156.0 GW(e).h

Date of First Criticality: 24 Mar 1993      Cumulative Energy Availability Factor: 74.8%

Date of Grid Connection: 11 Apr 1993      Cumulative Load Factor: 74.0%

Date of Commercial Operation: 22 Dec 1993      Cumulative Unit Capability Factor: 80.5%

Cumulative Energy Unavailability Factor: 25.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1993	423.2	950.0	60.0	60.0	60.0	60.0	59.9	59.9	480	64.5
1994	3828.5	950.0	69.5	68.8	48.5	49.4	46.0	47.1	4604	52.6
1995	5610.0	950.0	88.7	78.3	86.5	67.1	67.4	56.8	8760	100.0
1996	4545.5	950.0	59.9	72.3	55.5	63.4	54.5	56.1	6652	75.7
1997	4637.7	950.0	71.3	72.1	59.6	62.4	55.7	56.0	6637	75.8
1998	5042.5	950.0	71.3	71.9	60.9	62.1	60.6	56.9	6936	79.2
1999	5803.9	950.0	77.5	72.9	69.6	63.4	69.7	59.0	7268	83.0
2000	6665.9	950.0	81.0	74.0	78.9	65.6	79.9	62.0	7216	82.1
2001	6578.1	950.0	83.9	75.2	78.3	67.1	79.0	64.1	7354	83.9
2002	6292.9	950.0	77.3	75.5	72.8	67.8	75.6	65.3	6723	76.7
2003	7223.8	950.0	85.8	76.5	84.6	69.4	86.8	67.5	7541	86.1
2004	7022.9	950.0	85.4	77.3	82.5	70.6	84.2	69.0	7540	85.8
2005	6938.3	950.0	87.6	78.1	82.1	71.6	83.4	70.2	7699	87.9
2006	6805.4	950.0	82.2	78.4	79.6	72.2	81.8	71.1	7230	82.5
2007	7153.3	950.0	88.5	79.2	84.7	73.1	86.0	72.1	7787	88.9
2008	8330.4	950.0	99.7	80.5	99.7	74.8	100.1	74.0	8779	100.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1994 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					11	
C. Inspection, maintenance or repair combined with refuelling				1347		
D. Inspection, maintenance or repair without refuelling				21		
J. Grid limitation, failure or grid unavailability						22
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						111
Subtotal	0	0	0	1368	11	133
Total	0			1512		

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

System	2008 Hours Lost	1994 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		1
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		2
35. All other I&C Systems		2
41. Main Generator Systems		0
42. Electrical Power Supply Systems		2
Total	0	9



## RU-21 BELOYARSKY-3 (BN-600)

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** FBR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3781.0 GW(e).h  
**Energy Availability Factor:** 76.8%  
**Load Factor:** 77.1%  
**Operating Factor:** 79.0%  
**Energy Unavailability Factor:** 23.2%  
**Total Off-line Time:** 1842 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	413.7	388.1	295.2	0.0	52.1	388.1	413.7	420.3	367.6	215.4	409.1	417.8	3781.0
<b>EAF (%)</b>	99.4	99.7	71.5	-0.1	14.4	95.6	99.8	100.0	90.6	52.1	100.0	99.9	76.8
<b>UCF (%)</b>	100.0	100.0	71.6	-0.1	14.4	95.6	100.0	100.0	90.6	52.1	100.0	100.0	76.9
<b>LF (%)</b>	99.3	103.1	70.9	0.0	12.5	96.3	99.3	100.9	91.2	51.6	101.5	100.3	77.1
<b>OF (%)</b>	100.0	103.6	72.8	0.0	19.1	100.0	100.0	100.0	95.3	58.5	100.0	100.0	79.0
<b>EUF (%)</b>	0.6	0.3	28.5	100.1	85.6	4.4	0.2	0.0	9.4	47.9	0.0	0.1	23.2
<b>PUF (%)</b>	0.0	0.0	28.4	100.1	85.6	0.0	0.0	0.0	9.4	47.9	0.0	0.0	22.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4
<b>XUF (%)</b>	0.6	0.3	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - MARCH, MAY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 32048 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.03.23 TO 08.05.26. 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

<b>Date of Construction Start:</b>	01 Jan 1969	<b>Lifetime Generation:</b>	100702.0 GW(e).h
<b>Date of First Criticality:</b>	26 Feb 1980	<b>Cumulative Energy Availability Factor:</b>	73.8%
<b>Date of Grid Connection:</b>	08 Apr 1980	<b>Cumulative Load Factor:</b>	73.5%
<b>Date of Commercial Operation:</b>	01 Nov 1981	<b>Cumulative Unit Capability Factor:</b>	74.5%
		<b>Cumulative Energy Unavailability Factor:</b>	26.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981			Data not provided							
1982	2771.0	560.0	59.3	59.3	59.3	59.3	56.5	56.5	5555	63.4
1983	3545.2	560.0	73.4	66.3	72.7	66.0	72.3	64.4	6737	76.9
1984	3584.1	560.0	73.3	68.6	73.3	68.4	72.9	67.2	6848	78.0
1985	3561.8	560.0	72.9	69.7	72.9	69.5	72.6	68.6	6544	74.7
1986	3600.7	560.0	74.3	70.6	73.8	70.4	73.4	69.5	6818	77.8
1987	3895.0	600.0	75.9	71.5	75.9	71.4	74.1	70.3	6714	76.6
1988	3762.2	560.0	77.0	72.3	77.0	72.2	76.5	71.2	6810	77.5
1989	3694.4	560.0	77.0	72.9	77.0	72.8	75.3	71.7	6800	77.6
1990	3198.0	560.0	66.6	72.2	65.9	72.0	65.2	71.0	6627	75.7
1991	3394.0	560.0	63.6	71.3	63.6	71.2	69.2	70.8	6631	75.7
1992	4095.0	560.0	83.1	72.4	82.8	72.2	83.3	71.9	7449	84.8
1993	3914.9	560.0	79.6	73.0	79.5	72.8	79.8	72.6	7065	80.7
1994	3810.7	560.0	78.9	73.4	78.8	73.3	77.7	73.0	6977	79.6
1995	3413.3	560.0	72.3	73.4	70.7	73.1	69.6	72.7	6953	79.4
1996	3722.3	560.0	78.1	73.7	76.3	73.3	75.7	72.9	7010	79.8
1997	3545.8	560.0	74.6	73.7	73.0	73.3	72.3	72.9	6596	75.3
1998	2335.3	560.0	49.2	72.3	47.7	71.8	47.6	71.4	4385	50.1
1999	3721.0	560.0	78.0	72.6	76.2	72.0	75.9	71.7	6972	79.6
2000	3565.8	560.0	75.5	72.8	72.5	72.1	72.5	71.7	6820	77.6
2001	3891.1	560.0	80.7	73.2	79.9	72.4	79.3	72.1	7214	82.4
2002	3774.4	560.0	79.3	73.5	77.3	72.7	76.9	72.3	7069	80.7
2003	3693.3	560.0	76.8	73.6	75.7	72.8	75.3	72.4	6836	78.0
2004	3927.6	560.0	80.8	73.9	80.0	73.1	79.8	72.8	7185	81.8
2005	3802.7	560.0	78.8	74.1	77.8	73.3	77.5	73.0	6977	79.6
2006	3844.9	560.0	79.0	74.3	78.4	73.5	78.4	73.2	7001	79.9
2007	3798.4	560.0	77.8	74.4	77.5	73.7	77.4	73.3	7089	80.9
2008	3781.0	560.0	76.9	74.5	76.8	73.8	77.1	73.5	6918	79.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					174	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1981			1217		
D. Inspection, maintenance or repair without refuelling				479	6	
H. Nuclear regulatory requirement						0
J. Grid limitation, failure or grid unavailability						3
Subtotal	1981	0	0	1696	181	3
Total	1981			1880		

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		17
15. Reactor Cooling System:		41
21. Fuel Handling and Storage Facilities		4
32. Feedwater and Main Steam System		2
35. All other I&C Systems:		5
42. Electrical Power Supply System:		1
Total	0	70

## RU-141 BILIBINO-1

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 29.5 GW(e).h  
**Energy Availability Factor:** 72.5%  
**Load Factor:** 30.6%  
**Operating Factor:** 71.5%  
**Energy Unavailability Factor:** 27.5%  
**Total Off-line Time:** 2499 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	3.7	0.0	0.0	0.0	1.4	2.5	2.4	3.7	3.8	4.5	4.4	3.1	29.5
<b>EAF (%)</b>	100.0	1.2	4.5	4.4	72.2	100.0	100.0	100.0	99.8	100.0	100.0	81.6	72.5
<b>UCF (%)</b>	100.0	1.2	4.6	4.4	72.2	100.0	100.0	100.0	99.8	100.0	100.0	81.7	72.5
<b>LF (%)</b>	45.6	0.0	0.0	0.0	17.5	31.8	29.0	44.7	47.8	54.9	55.7	37.5	30.6
<b>OF (%)</b>	100.0	0.1	0.0	0.0	70.8	100.0	100.0	100.0	99.4	99.9	100.0	80.8	71.5
<b>EUF (%)</b>	0.0	98.8	95.5	95.6	27.8	0.0	0.0	0.0	0.2	0.0	0.0	18.4	27.5
<b>PUF (%)</b>	0.0	98.8	95.5	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	18.4	17.3
<b>UCLF (%)</b>	0.0	0.0	0.0	95.6	27.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2
<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. 2008 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.02.01 TO 08.03.31.

RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jan 1970	<b>Lifetime Generation:</b>	1822.0 GW(e).h
<b>Date of First Criticality:</b>	11 Dec 1973	<b>Cumulative Energy Availability Factor:</b>	68.9%
<b>Date of Grid Connection:</b>	12 Jan 1974	<b>Cumulative Load Factor:</b>	56.9%
<b>Date of Commercial Operation:</b>	01 Apr 1974	<b>Cumulative Unit Capability Factor:</b>	80.1%
		<b>Cumulative Energy Unavailability Factor:</b>	31.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	45.3	10.0	88.0	88.0	88.0	88.0	68.7	68.7	5846	88.6
1975	56.5	10.0	80.2	83.6	74.4	80.2	64.5	66.3	7105	81.1
1976	55.5	10.0	90.9	86.2	83.7	81.5	63.2	65.2	7830	89.1
1977	43.7	10.0	81.4	85.0	70.4	78.5	49.9	61.1	6846	78.2
1978	53.8	10.0	91.3	86.3	91.3	81.2	61.5	61.2	7466	85.2
1979	64.8	10.0	81.2	85.4	76.0	80.3	74.0	63.4	7574	86.5
1980	59.4	10.0	81.8	84.9	74.1	79.4	67.6	64.0	8065	91.8
1981	50.7	10.0	82.0	84.5	72.7	78.5	57.9	63.2	7260	82.9
1982	72.3	10.0	85.0	84.6	85.0	79.3	82.5	65.4	7627	87.1
1983	69.9	10.0	88.7	85.0	83.3	79.7	79.8	66.9	7810	89.2
1984	77.9	10.0	88.9	85.3	88.0	80.5	88.7	68.9	7854	89.4
1985	77.7	10.0	91.2	85.8	88.4	81.1	88.7	70.6	8025	91.6
1986	73.2	10.0	86.1	85.9	83.2	81.3	83.5	71.6	7603	86.8
1987	76.7	12.0	81.3	85.5	81.3	81.3	73.0	71.7	7117	81.2
1988	79.6	11.0	90.3	85.8	90.3	82.0	82.4	72.5	7895	89.9
1989	70.9	11.0	90.0	86.1	90.0	82.5	73.5	72.6	7841	89.5
1990	76.6	11.0	85.1	86.0	85.1	82.7	79.5	73.0	7397	84.4
1991	71.6	11.0	78.6	85.6	78.6	82.4	74.3	73.1	6802	77.6
1992	67.1	11.0	85.8	85.6	85.8	82.6	69.4	72.9	7477	85.1
1993	53.2	11.0	86.3	85.7	62.7	81.6	55.2	72.0	7492	85.5
1994	49.6	11.0	86.9	85.7	86.9	81.8	51.5	70.9	7501	85.6
1995	26.6	11.0	41.6	83.6	41.6	79.9	27.6	68.8	3624	41.4
1996	29.6	11.0	54.1	82.2	54.1	78.7	30.7	67.1	4572	52.0
1997	35.2	11.0	56.5	81.1	56.5	77.7	36.6	65.7	4877	55.7
1998	55.5	11.0	96.3	81.7	67.0	77.3	57.6	65.4	8414	96.1
1999	33.4	11.0	54.9	80.7	40.3	75.8	34.7	64.1	4779	54.6
2000	58.8	11.0	87.4	80.9	68.1	75.5	60.8	64.0	7616	86.7
2001	45.9	11.0	72.9	80.6	55.0	74.7	47.6	63.4	6393	73.0
2002	49.6	11.0	84.5	80.8	60.0	74.2	51.5	63.0	7375	84.2
2003	25.8	11.0	55.8	79.9	34.1	72.8	26.8	61.7	4805	54.9
2004	34.6	11.0	85.2	80.1	46.6	71.9	35.8	60.8	7434	84.6
2005	26.2	11.0	79.8	80.1	38.5	70.8	27.2	59.7	6904	78.8
2006	23.9	11.0	84.3	80.2	36.3	69.7	24.8	58.6	7162	81.8
2007	28.4	11.0	85.6	80.4	40.7	68.8	29.5	57.7	7154	81.7
2008	29.5	11.0	72.5	80.1	72.5	68.9	30.6	56.9	6261	71.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 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	1582			1172		
D. Inspection, maintenance or repair without refuelling				378	17	
E. Testing of plant systems or component:	4			2		
H. Nuclear regulatory requirement		937				
J. Grid limitation, failure or grid unavailability				2	0	38
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				7	10	7
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					1	
Subtotal	1586	937	0	1561	98	45
Total	2523			1704		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		0
13. Reactor Auxiliary System:		4
14. Safety Systems		1
15. Reactor Cooling System:		2
31. Turbine and auxiliaries		23
32. Feedwater and Main Steam System		10
33. Circulating Water System		5
35. All other I&C Systems		2
41. Main Generator System:		16
42. Electrical Power Supply System:		1
Total	0	66

## RU-142 BILIBINO-2

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 30.3 GW(e).h  
**Energy Availability Factor:** 78.7%  
**Load Factor:** 31.4%  
**Operating Factor:** 74.1%  
**Energy Unavailability Factor:** 21.3%  
**Total Off-line Time:** 2270 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	3.4	4.1	4.1	2.2	0.0	0.0	1.4	1.2	2.7	4.5	3.2	3.5	30.3
<b>EAF (%)</b>	99.6	100.0	100.0	81.0	4.5	4.5	56.4	100.0	100.0	100.0	99.6	100.0	78.7
<b>UCF (%)</b>	99.7	100.0	100.0	81.0	4.6	4.6	56.4	100.0	100.0	100.0	99.6	100.0	78.7
<b>LF (%)</b>	41.0	55.7	49.7	27.6	0.0	0.0	17.0	14.9	34.4	54.9	40.0	43.3	31.4
<b>OF (%)</b>	99.1	103.6	100.0	80.3	0.0	0.0	54.3	55.1	100.0	99.9	99.2	100.0	74.1
<b>EUF (%)</b>	0.4	0.0	0.0	19.0	95.5	95.5	43.6	0.0	0.0	0.0	0.4	0.0	21.3
<b>PUF (%)</b>	0.4	0.0	0.0	19.0	95.5	95.5	43.6	0.0	0.0	0.0	0.4	0.0	21.3
<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. 2008 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 08.04.25 TO 08.07.15. 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  
**Date of First Criticality:** 07 Dec 1974  
**Date of Grid Connection:** 30 Dec 1974  
**Date of Commercial Operation:** 01 Feb 1975

**Lifetime Generation:** 1752.0 GW(e).h  
**Cumulative Energy Availability Factor:** 69.4%  
**Cumulative Load Factor:** 55.9%  
**Cumulative Unit Capability Factor:** 81.5%  
**Cumulative Energy Unavailability Factor:** 30.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	62.6	10.0	94.7	94.7	89.0	89.0	78.1	78.1	7226	90.1
1976	66.1	10.0	89.4	91.9	83.7	86.2	75.3	76.6	7901	89.9
1977	57.0	10.0	90.5	91.4	81.3	84.5	65.1	72.7	7865	89.8
1978	60.6	10.0	94.8	92.3	94.8	87.2	69.2	71.8	7929	90.5
1979	69.9	10.0	92.9	92.4	88.2	87.4	79.7	73.4	8170	93.3
1980	44.0	10.0	62.7	87.4	59.8	82.7	50.1	69.5	5666	64.5
1981	41.4	10.0	73.1	85.3	70.4	80.9	47.2	66.3	6520	74.4
1982	63.9	10.0	79.2	84.6	79.2	80.7	73.0	67.1	7028	80.2
1983	73.8	10.0	90.1	85.2	86.9	81.4	84.2	69.0	7880	90.0
1984	77.6	10.0	89.3	85.6	88.5	82.1	88.4	71.0	7891	89.8
1985	78.0	10.0	90.3	86.0	88.6	82.7	89.0	72.6	7940	90.6
1986	76.3	10.0	87.0	86.1	84.7	82.9	87.1	73.8	7679	87.7
1987	88.4	12.0	89.1	86.4	89.1	83.4	84.1	74.8	7794	89.0
1988	75.1	11.0	90.8	86.7	90.8	84.0	77.7	75.0	7927	90.2
1989	74.8	11.0	91.4	87.1	91.4	84.5	77.6	75.2	7943	90.7
1990	72.6	11.0	84.6	86.9	84.6	84.5	75.4	75.2	7274	83.0
1991	57.8	11.0	64.9	85.5	64.9	83.3	60.0	74.3	4821	55.0
1992	68.2	11.0	89.9	85.8	89.9	83.7	70.6	74.0	7857	89.4
1993	52.4	11.0	81.9	85.6	62.2	82.5	54.4	72.9	7072	80.7
1994	47.8	11.0	78.7	85.2	77.3	82.2	49.6	71.7	6763	77.2
1995	45.4	11.0	99.2	85.9	97.2	83.0	47.2	70.5	8677	99.1
1996	16.8	11.0	33.5	83.4	33.5	80.6	17.4	67.9	2894	32.9
1997	44.1	11.0	92.7	83.8	87.7	80.9	45.8	66.9	8050	91.9
1998	18.2	11.0	42.9	82.0	23.3	78.4	18.8	64.8	3727	42.5
1999	54.2	11.0	84.7	82.1	64.1	77.8	56.2	64.5	7355	84.0
2000	48.5	11.0	78.2	82.0	56.3	77.0	50.2	63.9	6656	75.8
2001	56.7	11.0	85.2	82.1	65.8	76.5	58.9	63.7	7439	84.9
2002	30.0	11.0	66.4	81.5	38.4	75.1	31.2	62.5	5744	65.6
2003	33.3	11.0	82.2	81.6	44.5	74.0	34.5	61.5	7162	81.8
2004	17.9	11.0	70.3	81.2	27.2	72.4	18.5	60.0	5851	66.6
2005	25.3	11.0	84.9	81.3	38.2	71.3	26.3	58.9	7351	83.9
2006	20.3	11.0	84.2	81.4	32.7	70.0	21.1	57.7	7248	82.7
2007	26.4	11.0	86.7	81.5	39.9	69.1	27.4	56.7	7478	85.4
2008	30.3	11.0	78.7	81.5	78.7	69.4	31.4	55.9	6490	74.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		0			128	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	1947			1304	88	
D. Inspection, maintenance or repair without refuelling				138		
E. Testing of plant systems or component:	7			5		
J. Grid limitation, failure or grid unavailability					0	16
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			334	6		
Subtotal	1954	0	334	1453	220	16
Total		2288			1689	

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		74
12. Reactor I&C Systems	0	2
14. Safety Systems		0
15. Reactor Cooling System:		7
31. Turbine and auxiliaries		22
32. Feedwater and Main Steam System		9
33. Circulating Water System		0
41. Main Generator System:		7
Total	0	121



## RU-143 BILIBINO-3

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 33.3 GW(e).h  
**Energy Availability Factor:** 85.7%  
**Load Factor:** 34.5%  
**Operating Factor:** 83.7%  
**Energy Unavailability Factor:** 14.3%  
**Total Off-line Time:** 1425 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	3.2	3.9	4.3	3.2	3.8	2.3	1.1	0.0	2.2	3.4	3.0	2.9	33.3
<b>EAF (%)</b>	100.0	98.2	100.0	99.2	100.0	100.0	57.0	4.5	71.5	100.0	100.0	100.0	85.7
<b>UCF (%)</b>	100.0	98.2	100.0	99.2	100.0	100.0	57.0	4.6	71.5	100.0	100.0	100.0	85.7
<b>LF (%)</b>	39.3	53.3	52.7	40.5	46.7	28.6	13.0	0.0	28.1	41.5	37.4	35.0	34.5
<b>OF (%)</b>	100.0	100.4	100.0	98.6	100.0	86.8	51.3	0.0	70.1	99.9	100.0	99.9	83.7
<b>EUF (%)</b>	0.0	1.8	0.0	0.8	0.0	0.0	43.0	95.5	28.5	0.0	0.0	0.0	14.3
<b>PUF (%)</b>	0.0	1.8	0.0	0.0	0.0	0.0	43.0	95.5	28.5	0.0	0.0	0.0	14.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.8	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. 2008 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.07.18 TO 08.09.09. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jan 1970	<b>Lifetime Generation:</b>	1756.0 GW(e).h
<b>Date of First Criticality:</b>	06 Dec 1975	<b>Cumulative Energy Availability Factor:</b>	68.8%
<b>Date of Grid Connection:</b>	22 Dec 1975	<b>Cumulative Load Factor:</b>	57.9%
<b>Date of Commercial Operation:</b>	01 Feb 1976	<b>Cumulative Unit Capability Factor:</b>	81.1%
		<b>Cumulative Energy Unavailability Factor:</b>	31.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976	50.0	10.0	90.5	90.5	83.3	83.3	62.2	62.2	6222	77.4
1977	46.5	10.0	92.8	91.7	78.2	80.7	53.1	57.4	7533	86.0
1978	61.9	10.0	86.2	89.9	86.2	82.6	70.6	62.0	7514	85.8
1979	62.1	10.0	88.9	89.6	82.5	82.5	70.9	64.2	7837	89.5
1980	79.4	10.0	92.2	90.1	91.0	84.3	90.4	69.6	8130	92.6
1981	89.8	10.0	96.6	91.2	96.6	86.4	102.5	75.1	8480	96.8
1982	79.3	10.0	94.8	91.8	94.8	87.6	90.6	77.4	8323	95.0
1983	72.8	10.0	88.8	91.4	85.3	87.3	83.1	78.1	7782	88.8
1984	76.5	10.0	89.1	91.1	87.4	87.3	87.1	79.1	7876	89.7
1985	69.8	10.0	80.3	90.1	78.5	86.4	79.7	79.2	7119	81.3
1986	77.1	10.0	91.0	90.1	87.7	86.5	88.0	80.0	8001	91.3
1987	89.1	12.0	89.1	90.0	89.1	86.8	84.7	80.4	7801	89.1
1988	76.7	11.0	89.5	90.0	89.5	87.0	79.4	80.4	7815	89.0
1989	74.3	11.0	89.5	89.9	89.1	87.2	77.1	80.1	7756	88.5
1990	73.7	11.0	92.0	90.1	91.1	87.4	76.5	79.9	8024	91.6
1991	66.2	11.0	78.1	89.3	76.6	86.7	68.7	79.1	6749	77.0
1992	70.9	11.0	79.7	88.7	79.7	86.3	73.4	78.8	7727	88.0
1993	52.6	11.0	83.2	88.4	61.5	84.8	54.6	77.3	7218	82.4
1994	44.7	11.0	73.7	87.6	72.0	84.1	46.4	75.6	6342	72.4
1995	17.3	11.0	38.2	85.0	34.9	81.5	17.9	72.6	3293	37.6
1996	52.6	11.0	82.3	84.8	82.3	81.6	54.5	71.7	7142	81.3
1997	25.8	11.0	42.9	82.8	42.9	79.7	26.8	69.5	3769	43.0
1998	23.2	11.0	49.1	81.3	29.1	77.4	24.0	67.5	4200	47.9
1999	51.4	11.0	75.9	81.1	59.9	76.7	53.4	66.9	6607	75.4
2000	45.2	11.0	86.8	81.3	54.8	75.8	46.8	66.0	7569	86.2
2001	53.9	11.0	84.9	81.4	63.0	75.2	56.0	65.6	7383	84.3
2002	30.7	11.0	71.5	81.1	39.4	73.9	31.9	64.3	6250	71.3
2003	35.4	11.0	81.5	81.1	46.7	72.9	36.8	63.3	7097	81.0
2004	31.1	11.0	85.8	81.2	42.0	71.8	32.2	62.2	7166	81.6
2005	20.4	11.0	71.1	80.9	30.9	70.4	21.1	60.8	6102	69.7
2006	26.3	11.0	76.7	80.8	36.9	69.2	27.2	59.7	6542	74.7
2007	27.5	11.0	85.7	80.9	38.6	68.3	28.5	58.7	7257	82.8
2008	33.3	11.0	85.7	81.1	85.7	68.8	34.5	57.9	7335	83.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		11			62	
C. Inspection, maintenance or repair combined with refuelling	1294			1223		
D. Inspection, maintenance or repair without refuelling				343		
E. Testing of plant systems or component:	21			6		
J. Grid limitation, failure or grid unavailability					1	47
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			122	15	1	13
Subtotal	1315	11	122	1587	64	60
Total	1448			1711		

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		1
15. Reactor Cooling System:		17
31. Turbine and auxiliaries:	11	14
32. Feedwater and Main Steam System		9
33. Circulating Water System		0
Total	11	41

## RU-144 BILIBINO-4

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 29.6 GW(e).h  
**Energy Availability Factor:** 87.6%  
**Load Factor:** 30.7%  
**Operating Factor:** 80.2%  
**Energy Unavailability Factor:** 12.4%  
**Total Off-line Time:** 1737 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	2.7	3.9	3.1	3.7	2.9	1.8	2.8	2.6	1.3	0.0	1.5	3.1	29.6
<b>EAF (%)</b>	99.5	100.0	99.0	100.0	99.6	100.0	100.0	100.0	84.1	4.7	65.9	100.0	87.6
<b>UCF (%)</b>	99.5	100.0	99.0	100.0	99.7	100.0	100.0	100.0	84.1	4.7	65.9	100.0	87.6
<b>LF (%)</b>	33.5	53.4	37.6	47.2	35.8	23.3	33.8	31.9	16.3	0.0	18.6	38.3	30.7
<b>OF (%)</b>	98.8	103.6	97.6	100.1	98.5	78.3	100.0	81.9	40.1	0.0	64.3	100.0	80.2
<b>EUF (%)</b>	0.5	0.0	1.0	0.0	0.4	0.0	0.0	0.0	15.9	95.3	34.1	0.0	12.4
<b>PUF (%)</b>	0.5	0.0	0.0	0.0	0.4	0.0	0.0	0.0	15.9	95.3	34.1	0.0	12.3
<b>UCLF (%)</b>	0.0	0.0	1.0	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. 2008 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 08.09.26 TO 08.11.11. RADIONUCLIDES CONTENT IN THE MONITORED ENVIRONMENTAL OBJECTS IN THE PLANT VICINITY WAS ON THE LEVEL OF AVERAGE BACKGROUND VALUES.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jan 1970	<b>Lifetime Generation:</b>	1630.0 GW(e).h
<b>Date of First Criticality:</b>	12 Dec 1976	<b>Cumulative Energy Availability Factor:</b>	67.0%
<b>Date of Grid Connection:</b>	27 Dec 1976	<b>Cumulative Load Factor:</b>	56.3%
<b>Date of Commercial Operation:</b>	01 Jan 1977	<b>Cumulative Unit Capability Factor:</b>	78.8%
		<b>Cumulative Energy Unavailability Factor:</b>	33.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	52.6	10.0	93.6	93.6	82.9	82.9	60.1	60.1	7392	84.4
1978	58.3	10.0	91.1	92.3	91.1	87.0	66.6	63.3	7827	89.3
1979	74.5	10.0	85.5	90.0	83.9	85.9	85.0	70.5	7552	86.2
1980	77.6	10.0	94.8	91.2	92.9	87.7	88.4	75.0	8347	95.0
1981	78.3	10.0	87.7	90.5	86.6	87.5	89.3	77.9	7734	88.3
1982	77.6	10.0	90.7	90.6	90.7	88.0	88.6	79.7	7976	91.1
1983	75.5	10.0	90.0	90.5	86.9	87.9	86.2	80.6	7923	90.4
1984	79.0	10.0	87.6	90.1	86.8	87.7	89.9	81.8	7744	88.2
1985	81.2	10.0	90.3	90.1	89.5	87.9	92.7	83.0	7919	90.4
1986	74.5	10.0	79.9	89.1	79.8	87.1	85.1	83.2	7083	80.9
1987	95.5	12.0	93.3	89.6	93.3	87.8	90.9	84.0	8154	93.1
1988	75.8	11.0	87.3	89.4	87.3	87.7	78.5	83.5	7617	86.7
1989	71.4	11.0	93.2	89.7	93.2	88.2	74.1	82.7	7853	89.6
1990	75.3	11.0	87.2	89.5	86.4	88.0	78.1	82.4	7588	86.6
1991	61.3	11.0	71.4	88.2	69.9	86.8	63.6	81.1	6139	70.1
1992	69.8	11.0	87.8	88.2	87.8	86.8	72.3	80.5	7756	88.3
1993	56.0	11.0	80.2	87.7	64.4	85.4	58.1	79.1	6918	79.0
1994	38.5	11.0	62.0	86.2	61.8	84.1	39.9	76.8	5266	60.1
1995	29.9	11.0	63.9	85.0	62.7	82.9	31.0	74.3	5083	58.0
1996	35.2	11.0	59.1	83.6	59.1	81.7	36.4	72.3	5109	58.2
1997	15.1	11.0	37.0	81.3	28.4	79.0	15.7	69.5	2490	28.4
1998	37.3	11.0	63.1	80.5	44.5	77.4	38.7	68.1	5510	62.9
1999	28.7	11.0	46.7	78.9	34.8	75.5	29.8	66.4	3993	45.6
2000	55.8	11.0	88.7	79.4	64.2	75.0	57.8	66.0	7740	88.1
2001	35.4	11.0	68.0	78.9	43.2	73.7	36.8	64.8	5931	67.7
2002	33.1	11.0	73.8	78.7	46.3	72.6	34.4	63.6	6419	73.3
2003	24.5	11.0	67.5	78.3	34.0	71.1	25.4	62.1	5849	66.8
2004	26.1	11.0	83.9	78.5	36.7	69.8	27.0	60.8	7303	83.1
2005	24.9	11.0	84.3	78.7	36.3	68.7	25.9	59.6	7300	83.3
2006	25.2	11.0	76.9	78.6	36.4	67.6	26.2	58.4	6626	75.6
2007	19.6	11.0	76.5	78.5	30.9	66.3	20.3	57.2	5983	68.3
2008	29.6	11.0	87.6	78.8	87.6	67.0	30.7	56.3	7023	80.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 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	1121			1394		
D. Inspection, maintenance or repair without refuelling				432		
E. Testing of plant systems or component:	20			7		
J. Grid limitation, failure or grid unavailability						73
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			602		1	19
L. Human factor related		18			0	
Subtotal	1141	18	602	1833	58	92
Total		1761			1983	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		14
13. Reactor Auxiliary System:		8
15. Reactor Cooling System:		1
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		6
33. Circulating Water System		5
41. Main Generator System:		18
Total	0	56

## RU-30 KALININ-1

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6953.5 GW(e).h  
**Energy Availability Factor:** 81.5%  
**Load Factor:** 83.6%  
**Operating Factor:** 82.3%  
**Energy Unavailability Factor:** 18.5%  
**Total Off-line Time:** 1551 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	716.9	631.0	691.8	712.6	712.7	617.8	715.7	658.1	0.0	55.6	703.1	738.4	6953.5
<b>EAF (%)</b>	96.3	91.9	95.4	100.0	97.4	95.3	100.0	92.5	0.0	9.1	99.9	100.0	81.5
<b>UCF (%)</b>	96.3	92.0	95.4	100.0	97.4	95.3	100.0	92.5	0.0	9.1	99.9	100.0	81.5
<b>LF (%)</b>	101.4	98.8	97.9	104.3	100.8	90.3	101.3	93.1	0.0	7.9	102.8	104.5	83.6
<b>OF (%)</b>	96.6	96.7	96.0	100.1	97.7	95.7	100.0	94.2	0.0	10.9	100.0	100.0	82.3
<b>EUF (%)</b>	3.7	8.1	4.6	0.0	2.6	4.7	0.0	7.5	100.0	90.9	0.1	0.0	18.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	100.0	90.9	0.1	0.0	16.5
<b>UCLF (%)</b>	3.7	8.1	4.6	0.0	2.6	4.7	0.0	1.3	0.0	0.0	0.1	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. 2008 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, NOVEMBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 180997 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.08.30 TO 08.10.28. 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

<b>Date of Construction Start:</b>	01 Feb 1977	<b>Lifetime Generation:</b>	145462.0 GW(e).h
<b>Date of First Criticality:</b>	10 Apr 1984	<b>Cumulative Energy Availability Factor:</b>	71.8%
<b>Date of Grid Connection:</b>	09 May 1984	<b>Cumulative Load Factor:</b>	72.6%
<b>Date of Commercial Operation:</b>	12 Jun 1985	<b>Cumulative Unit Capability Factor:</b>	72.8%
		<b>Cumulative Energy Unavailability Factor:</b>	28.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	2799.6	950.0	58.3	58.3	58.3	58.3	57.4	57.4	3101	60.4
1986	5297.7	950.0	62.8	61.2	62.8	61.2	63.7	61.3	5946	67.9
1987	6842.5	1000.0	78.7	68.2	78.7	68.2	78.1	68.0	6972	79.6
1988	5891.6	950.0	70.1	68.7	70.1	68.7	70.6	68.7	6187	70.4
1989	6129.7	950.0	71.9	69.4	71.9	69.4	73.7	69.8	6396	73.0
1990	5192.3	950.0	61.6	68.0	61.5	68.0	62.4	68.5	5435	62.0
1991	6482.7	950.0	78.1	69.5	77.1	69.4	77.9	69.9	7161	81.7
1992	6781.4	950.0	80.4	70.9	80.3	70.8	81.3	71.4	7388	84.1
1993	4927.2	950.0	66.6	70.4	59.4	69.5	59.2	70.0	6133	70.0
1994	4437.6	950.0	54.4	68.8	54.1	67.9	53.3	68.3	5440	62.1
1995	4699.0	950.0	57.0	67.7	56.8	66.8	56.5	67.1	6265	71.5
1996	4431.7	950.0	53.3	66.4	53.2	65.7	53.1	65.9	5628	64.1
1997	5197.1	950.0	65.0	66.3	63.2	65.5	62.4	65.7	6195	70.7
1998	6101.0	950.0	73.3	66.8	73.0	66.0	73.3	66.2	6937	79.2
1999	5775.1	950.0	73.1	67.3	69.3	66.3	69.4	66.4	6589	75.2
2000	6289.7	950.0	76.8	67.9	75.0	66.8	75.4	67.0	6784	77.2
2001	6627.5	950.0	79.4	68.6	78.2	67.5	79.6	67.8	7020	80.1
2002	7248.4	950.0	86.1	69.6	84.7	68.5	87.1	68.9	7568	86.4
2003	7155.9	950.0	83.7	70.3	83.1	69.3	86.0	69.8	7408	84.6
2004	6937.0	950.0	81.5	70.9	80.7	69.8	83.1	70.5	7179	81.7
2005	6836.3	950.0	81.5	71.4	80.4	70.3	82.1	71.0	7219	82.4
2006	6743.6	950.0	80.6	71.8	79.5	70.8	81.0	71.5	7112	81.2
2007	7150.4	950.0	85.2	72.4	84.0	71.4	85.9	72.1	7491	85.5
2008	6953.5	950.0	81.5	72.8	81.5	71.8	83.6	72.6	7209	82.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		148			269	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	1427			1533	45	
D. Inspection, maintenance or repair without refuelling				105		
E. Testing of plant systems or component:					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					52	
L. Human factor related					1	
Subtotal	1427	148	0	1638	373	0
Total		1575			2011	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		12
15. Reactor Cooling System:		3
16. Steam generation system:		43
17. Safety I&C Systems (excluding reactor I&C)		5
31. Turbine and auxiliaries	29	34
32. Feedwater and Main Steam System	119	26
35. All other I&C Systems		8
41. Main Generator System:		108
42. Electrical Power Supply System:		9
Total	148	260



## RU-31 KALININ-2

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7474.8 GW(e).h  
**Energy Availability Factor:** 88.2%  
**Load Factor:** 89.8%  
**Operating Factor:** 88.5%  
**Energy Unavailability Factor:** 11.8%  
**Total Off-line Time:** 1004 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	732.5	684.3	720.5	705.5	716.4	679.8	91.1	324.6	714.7	745.7	741.6	618.2	7474.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	97.5	100.0	13.2	49.9	100.0	100.0	100.0	100.0	88.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	97.5	100.0	13.2	49.9	100.0	100.0	100.0	100.0	88.2
<b>LF (%)</b>	103.6	107.2	101.9	103.3	101.4	99.4	12.9	45.9	104.5	105.4	108.4	87.5	89.8
<b>OF (%)</b>	100.0	103.6	99.9	100.1	98.0	100.0	13.6	50.3	100.0	100.0	100.0	100.0	88.5
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	2.5	0.0	86.8	50.1	0.0	0.0	0.0	0.0	11.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	86.8	50.0	0.0	0.0	0.0	0.0	11.6
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
<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. 2008 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 253839 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.07.05 TO 08.08.16. 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

<b>Date of Construction Start:</b>	01 Feb 1982	<b>Lifetime Generation:</b>	134323.0 GW(e).h
<b>Date of First Criticality:</b>	25 Nov 1986	<b>Cumulative Energy Availability Factor:</b>	71.9%
<b>Date of Grid Connection:</b>	03 Dec 1986	<b>Cumulative Load Factor:</b>	73.5%
<b>Date of Commercial Operation:</b>	03 Mar 1987	<b>Cumulative Unit Capability Factor:</b>	74.9%
		<b>Cumulative Energy Unavailability Factor:</b>	28.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	5815.1	1000.0	86.3	86.3	86.3	86.3	79.2	79.2	6460	88.0
1988	5829.4	950.0	71.7	78.5	71.7	78.5	69.9	74.2	6446	73.4
1989	6580.5	950.0	78.5	78.5	78.5	78.5	79.1	75.9	7034	80.3
1990	6788.2	950.0	79.5	78.7	79.5	78.7	81.6	77.4	7083	80.9
1991	4729.7	950.0	49.8	72.8	49.8	72.8	56.8	73.2	5154	58.8
1992	5496.3	950.0	65.7	71.6	65.7	71.6	65.9	71.9	6145	70.0
1993	5862.3	950.0	56.5	69.4	51.9	68.7	70.4	71.7	7078	80.8
1994	4463.8	950.0	54.9	67.6	54.9	67.0	53.6	69.4	6989	79.8
1995	5769.7	950.0	72.4	68.1	69.5	67.3	69.3	69.4	7283	83.1
1996	4595.2	950.0	78.4	69.1	56.0	66.1	55.1	68.0	7501	85.4
1997	3880.6	950.0	62.7	68.6	47.3	64.4	46.6	66.0	6117	69.8
1998	4946.7	950.0	60.0	67.8	59.7	64.0	59.4	65.4	6839	78.1
1999	6379.3	950.0	80.0	68.8	76.2	64.9	76.7	66.3	7155	81.7
2000	6418.7	950.0	83.6	69.8	76.3	65.8	76.9	67.1	7441	84.7
2001	6709.0	950.0	80.0	70.5	79.2	66.7	80.6	68.0	7070	80.7
2002	7003.4	950.0	85.8	71.5	82.7	67.7	84.2	69.0	7554	86.2
2003	7329.5	950.0	85.9	72.3	85.3	68.7	88.1	70.1	7541	86.1
2004	7398.2	950.0	87.1	73.2	86.7	69.7	88.7	71.2	7674	87.4
2005	6116.3	950.0	73.6	73.2	72.1	69.8	73.5	71.3	6476	73.9
2006	7074.9	950.0	84.3	73.7	82.7	70.5	85.0	72.0	7400	84.5
2007	7231.4	950.0	85.5	74.3	84.2	71.1	86.9	72.7	7539	86.1
2008	7474.8	950.0	88.2	74.9	88.2	71.9	89.8	73.5	7756	88.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		15			218	
B. Refuelling without a maintenance					13	
C. Inspection, maintenance or repair combined with refuelling	1013			1317	9	
D. Inspection, maintenance or repair without refuelling				89		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	
Z. Others					1	
Subtotal	1013	15	0	1406	244	0
Total		1028			1650	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		27
15. Reactor Cooling System	0	39
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries	15	42
32. Feedwater and Main Steam System		7
35. All other I&C Systems		9
41. Main Generator System		69
42. Electrical Power Supply System		2
XX. Miscellaneous Systems		2
Total	15	204

## RU-36 KALININ-3

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power at the beginning of 2008:** 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 2008

**Net Energy Production:** 7561.7 GW(e).h  
**Energy Availability Factor:** 87.7%  
**Load Factor:** 90.9%  
**Operating Factor:** 88.3%  
**Energy Unavailability Factor:** 12.3%  
**Total Off-line Time:** 1023 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	708.0	676.9	724.7	581.3	0.0	685.5	698.3	703.0	695.6	730.3	702.3	655.6	7561.7
<b>EAF (%)</b>	100.0	100.0	100.0	83.6	0.0	72.1	98.9	99.2	100.0	100.0	100.0	100.0	87.7
<b>UCF (%)</b>	100.0	100.0	100.0	84.0	0.0	72.1	98.9	99.2	100.0	100.0	100.0	100.0	87.7
<b>LF (%)</b>	100.2	106.0	102.5	85.1	0.0	100.2	98.8	99.5	101.7	103.2	102.7	92.8	90.9
<b>OF (%)</b>	100.0	103.6	99.9	84.7	0.0	73.3	100.0	100.0	100.0	100.0	100.0	100.0	88.3
<b>EUF (%)</b>	0.0	0.0	0.0	16.4	100.0	27.9	1.1	0.8	0.0	0.0	0.0	0.0	12.3
<b>PUF (%)</b>	0.0	0.0	0.0	16.0	100.0	27.9	0.0	0.0	0.0	0.0	0.0	0.0	12.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.8	0.0	0.0	0.0	0.0	0.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 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 123089 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.04.26 TO 08.06.09. 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 Oct 1985      **Lifetime Generation:** 25380.0 GW(e).h  
**Date of First Criticality:** 25 Nov 2004      **Cumulative Energy Availability Factor:** 83.4%  
**Date of Grid Connection:** 16 Dec 2004      **Cumulative Load Factor:** 85.1%  
**Date of Commercial Operation:** 08 Nov 2005      **Cumulative Unit Capability Factor:** 83.7%  
**Cumulative Energy Unavailability Factor:** 16.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2005	1402.5	950.0	100.0	100.0	100.0	100.0	100.8	100.8	1464	100.0
2006	6287.2	950.0	75.2	78.7	74.9	78.5	75.5	79.2	6692	76.4
2007	7185.2	950.0	85.5	81.9	85.0	81.5	86.3	82.5	7505	85.7
2008	7561.7	950.0	87.7	83.7	87.7	83.4	90.9	85.1	7737	88.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2006 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					128	
C. Inspection, maintenance or repair combined with refuelling	1047			917	59	
L. Human factor related					3	
Subtotal	1047	0	0	917	190	0
Total	1047			1107		

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

System	2008 Hours Lost	2006 to 2008 Average Hours Lost Per Year
15. Reactor Cooling System:		25
16. Steam generation system:		18
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		36
33. Circulating Water System		4
41. Main Generator System:		10
42. Electrical Power Supply System:		5
Total	0	125

## RU-12 KOLA-1

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2705.8 GW(e).h  
**Energy Availability Factor:** 84.3%  
**Load Factor:** 75.2%  
**Operating Factor:** 84.4%  
**Energy Unavailability Factor:** 15.7%  
**Total Off-line Time:** 1363 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	305.1	269.1	312.0	285.4	0.0	11.9	289.8	245.3	288.7	295.0	257.6	145.8	2705.8
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	9.7	5.2	97.2	100.0	100.0	100.0	100.0	100.0	84.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	9.7	5.2	97.2	100.0	100.0	100.0	100.0	100.0	84.3
<b>LF (%)</b>	99.8	97.4	102.0	96.6	0.0	4.0	94.8	80.2	97.6	96.4	87.1	47.7	75.2
<b>OF (%)</b>	100.0	103.6	99.9	100.1	0.4	10.3	100.0	100.0	100.0	100.0	100.0	100.0	84.4
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	90.3	94.8	2.8	0.0	0.0	0.0	0.0	0.0	15.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	90.3	94.8	2.8	0.0	0.0	0.0	0.0	0.0	15.7
<b>UCLF (%)</b>	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
<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. 2008 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 5806 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 08.05.04 TO 08.06.27. 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

<b>Date of Construction Start:</b>	01 May 1970	<b>Lifetime Generation:</b>	83570.0 GW(e).h
<b>Date of First Criticality:</b>	26 Jun 1973	<b>Cumulative Energy Availability Factor:</b>	69.9%
<b>Date of Grid Connection:</b>	29 Jun 1973	<b>Cumulative Load Factor:</b>	65.6%
<b>Date of Commercial Operation:</b>	28 Dec 1973	<b>Cumulative Unit Capability Factor:</b>	76.8%
		<b>Cumulative Energy Unavailability Factor:</b>	30.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	232.3	411.0	100.0	100.0	100.0	100.0	76.0	76.0	744	100.0
1974	1990.1	411.0	79.2	80.9	79.2	80.8	55.3	56.9	8463	96.6
1975	1015.8	411.0	50.9	66.5	50.9	66.5	28.2	43.1	5426	61.9
1976	2421.7	411.0	74.2	69.0	74.1	68.9	67.1	50.9	8247	93.9
1977	2101.1	411.0	76.4	70.8	76.4	70.8	58.4	52.7	7462	85.2
1978	2978.8	411.0	82.6	73.1	82.6	73.1	82.7	58.6	8074	92.2
1979	2435.6	411.0	64.6	71.7	64.6	71.7	67.6	60.1	6232	71.1
1980	3466.4	411.0	91.1	74.5	90.9	74.4	96.0	65.2	8072	91.9
1981	2870.8	411.0	81.0	75.3	80.9	75.2	79.7	67.0	7448	85.0
1982	2848.1	411.0	85.5	76.4	85.5	76.4	79.1	68.3	7875	89.9
1983	3217.4	411.0	88.3	77.6	88.2	77.5	89.4	70.4	7884	90.0
1984	3112.0	411.0	84.9	78.2	84.9	78.2	86.2	71.8	8060	91.8
1985	2388.8	411.0	67.0	77.3	67.0	77.3	66.3	71.4	6001	68.5
1986	2805.8	411.0	85.1	77.9	85.1	77.9	77.9	71.9	8074	92.2
1987	3268.2	440.0	86.0	78.5	86.0	78.5	84.8	72.9	7972	91.0
1988	2925.0	411.0	82.7	78.8	82.7	78.8	81.0	73.4	7482	85.2
1989	2675.5	411.0	76.2	78.6	75.4	78.6	74.3	73.5	6731	76.8
1990	2735.5	411.0	76.0	78.5	76.0	78.4	76.0	73.6	6838	78.1
1991	2773.1	411.0	77.3	78.4	77.3	78.3	77.0	73.8	6965	79.5
1992	2271.4	411.0	63.7	77.6	63.4	77.6	62.9	73.2	6651	75.7
1993	1992.6	411.0	59.6	76.7	56.1	76.5	55.3	72.3	5663	64.6
1994	1971.6	411.0	58.6	75.9	56.5	75.6	54.8	71.5	5359	61.2
1995	1581.4	411.0	62.2	75.3	62.2	75.0	43.9	70.3	5398	61.6
1996	1410.0	411.0	47.4	74.1	46.4	73.7	39.1	68.9	4466	50.8
1997	2404.1	411.0	88.5	74.7	88.5	74.3	66.8	68.8	7942	90.7
1998	1291.7	411.0	59.3	74.1	37.7	72.9	35.9	67.5	5658	64.6
1999	2028.5	411.0	86.6	74.5	58.0	72.3	56.3	67.1	7355	84.0
2000	1298.8	411.0	84.1	74.9	37.2	71.0	36.0	65.9	4643	52.9
2001	2243.2	411.0	81.6	75.1	63.3	70.7	62.3	65.8	7098	81.0
2002	1841.5	411.0	68.9	74.9	51.7	70.1	51.1	65.3	5660	64.6
2003	2164.0	411.0	75.5	74.9	60.4	69.8	60.1	65.1	6444	73.6
2004	2440.5	411.0	83.6	75.2	68.2	69.7	67.6	65.2	7326	83.4
2005	2151.7	411.0	90.6	75.7	60.6	69.4	59.8	65.0	6901	78.8
2006	2338.7	411.0	89.9	76.1	66.0	69.3	65.0	65.0	7661	87.5
2007	2658.0	411.0	91.0	76.6	74.4	69.5	73.8	65.3	7740	88.4
2008	2705.8	411.0	84.3	76.8	84.3	69.9	75.2	65.6	7397	84.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					58	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1318			1317	3	
D. Inspection, maintenance or repair without refuelling				181		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				74		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						6
J. Grid limitation, failure or grid unavailability			69			175
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					11	2
Subtotal	1318	0	69	1572	73	183
Total	1387			1828		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		4
15. Reactor Cooling Systems		16
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		8
35. All other I&C Systems		1
42. Electrical Power Supply System		1
Total	0	37

## RU-13 KOLA-2

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2554.7 GW(e).h  
**Energy Availability Factor:** 89.1%  
**Load Factor:** 71.0%  
**Operating Factor:** 88.6%  
**Energy Unavailability Factor:** 10.9%  
**Total Off-line Time:** 998 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	138.9	227.0	314.9	304.2	286.3	299.5	166.9	38.4	122.4	146.1	196.0	313.9	2554.7
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	95.3	30.8	58.4	85.8	100.0	100.0	89.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	35.5	58.4	85.8	100.0	100.0	89.9
<b>LF (%)</b>	45.4	82.2	103.0	103.0	93.6	101.2	54.6	12.6	41.4	47.7	66.2	102.7	71.0
<b>OF (%)</b>	85.5	103.6	99.9	100.1	100.0	100.0	100.0	27.6	58.3	89.9	100.0	100.0	88.6
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	4.7	69.2	41.6	14.2	0.0	0.0	10.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.5	41.6	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	14.2	0.0	0.0	1.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	4.7	4.7	0.0	0.0	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2008 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 - APRIL, JUNE, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 24130 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.08.12 TO 08.09.13. 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

<b>Date of Construction Start:</b>	01 May 1970	<b>Lifetime Generation:</b>	80931.0 GW(e).h
<b>Date of First Criticality:</b>	30 Nov 1974	<b>Cumulative Energy Availability Factor:</b>	70.7%
<b>Date of Grid Connection:</b>	08 Dec 1974	<b>Cumulative Load Factor:</b>	66.2%
<b>Date of Commercial Operation:</b>	21 Feb 1975	<b>Cumulative Unit Capability Factor:</b>	76.7%
		<b>Cumulative Energy Unavailability Factor:</b>	29.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	1325.2	411.0	88.2	88.2	88.2	88.2	40.2	40.2	6040	75.3
1976	1943.1	411.0	70.8	79.1	70.8	79.1	53.8	47.3	7083	80.6
1977	2627.2	411.0	77.1	78.4	76.9	78.4	73.0	56.1	7038	80.3
1978	2982.5	411.0	82.7	79.5	82.7	79.5	82.8	62.9	7576	86.5
1979	3057.6	411.0	83.5	80.3	82.4	80.1	84.9	67.4	7663	87.5
1980	3266.9	411.0	86.0	81.3	85.8	81.0	90.5	71.3	7966	90.7
1981	3146.7	411.0	87.8	82.2	87.8	82.0	87.4	73.6	8225	93.9
1982	2463.0	411.0	71.2	80.8	71.2	80.7	68.4	73.0	6742	77.0
1983	3072.6	411.0	85.3	81.3	85.3	81.2	85.3	74.4	7963	90.9
1984	3034.5	411.0	86.8	81.9	86.8	81.7	84.1	75.3	8079	92.0
1985	3055.6	411.0	84.9	82.2	84.9	82.0	84.9	76.2	7872	89.9
1986	2844.2	411.0	79.8	82.0	79.7	81.8	79.0	76.5	7405	84.5
1987	3345.4	440.0	89.6	82.6	89.6	82.5	86.8	77.3	7900	90.2
1988	2873.3	411.0	80.5	82.4	80.5	82.3	79.6	77.5	7451	84.8
1989	2707.3	411.0	78.0	82.1	74.8	81.8	75.2	77.3	6859	78.3
1990	2610.9	411.0	72.9	81.6	72.7	81.3	72.5	77.0	6751	77.1
1991	2701.9	411.0	75.4	81.2	75.3	80.9	75.0	76.9	6983	79.7
1992	2133.0	411.0	61.8	80.1	61.8	79.8	59.1	75.9	5871	66.8
1993	2138.8	411.0	65.7	79.4	60.7	78.8	59.4	75.0	6377	72.8
1994	398.6	411.0	16.7	76.2	16.7	75.7	11.1	71.8	1466	16.7
1995	2205.8	411.0	93.6	77.1	93.6	76.6	61.3	71.3	6846	78.2
1996	1946.2	411.0	66.3	76.6	65.5	76.1	53.9	70.5	6243	71.1
1997	1157.9	411.0	53.4	75.6	40.6	74.5	32.2	68.9	3955	45.1
1998	2655.6	411.0	83.6	75.9	74.5	74.5	73.8	69.1	8029	91.7
1999	1272.6	411.0	49.0	74.8	36.3	73.0	35.3	67.7	4423	50.5
2000	2430.5	411.0	83.4	75.2	68.2	72.8	67.3	67.7	7626	86.8
2001	1722.3	411.0	84.7	75.5	49.1	71.9	47.8	67.0	6574	75.0
2002	1738.7	411.0	83.2	75.8	48.7	71.1	48.3	66.3	5564	63.5
2003	1866.1	411.0	66.4	75.5	52.0	70.4	51.8	65.8	5459	62.3
2004	1787.1	411.0	73.8	75.4	49.9	69.8	49.5	65.3	5731	65.2
2005	2889.2	411.0	84.2	75.7	78.6	70.0	80.2	65.7	7379	84.2
2006	2640.1	411.0	85.7	76.0	72.0	70.1	73.3	66.0	7597	86.7
2007	2508.9	411.0	85.7	76.3	70.1	70.1	69.7	66.1	7474	85.3
2008	2554.7	411.0	89.9	76.7	89.1	70.7	71.0	66.2	7762	88.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					86	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	780			1380		
D. Inspection, maintenance or repair without refuelling				73		
E. Testing of plant systems or component				9		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				144		
J. Grid limitation, failure or grid unavailability			243			177
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	25
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					0	
Subtotal	780	0	243	1606	86	202
Total	1023			1894		

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		49
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		3
14. Safety Systems		2
15. Reactor Cooling Systems		21
16. Steam generation system		4
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		0
35. All other I&C Systems		0
41. Main Generator System		0
42. Electrical Power Supply System		0
Total	0	80

## RU-32 KOLA-3

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 1876.7 GW(e).h  
**Energy Availability Factor:** 83.8%  
**Load Factor:** 52.1%  
**Operating Factor:** 84.5%  
**Energy Unavailability Factor:** 16.2%  
**Total Off-line Time:** 1355 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	290.2	214.5	0.0	12.3	211.9	146.1	152.4	206.0	146.3	209.2	137.0	150.7	1876.7
<b>EAF (%)</b>	100.0	100.0	0.9	5.3	100.0	100.0	99.7	99.9	100.0	100.0	100.0	100.0	83.8
<b>UCF (%)</b>	100.0	100.0	0.9	5.3	100.0	100.0	99.7	99.9	100.0	100.0	100.0	100.0	83.8
<b>LF (%)</b>	94.9	77.7	0.0	4.2	69.3	49.4	49.8	67.4	49.4	68.3	46.3	49.3	52.1
<b>OF (%)</b>	100.0	103.6	1.5	10.8	100.0	100.0	99.3	100.0	100.0	100.0	100.0	100.0	84.5
<b>EUF (%)</b>	0.0	0.0	99.1	94.7	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0	16.2
<b>PUF (%)</b>	0.0	0.0	99.1	94.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	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. 2008 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 08.03.01 TO 08.04.27. 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

<b>Date of Construction Start:</b>	01 Apr 1977	<b>Lifetime Generation:</b>	68878.0 GW(e).h
<b>Date of First Criticality:</b>	07 Feb 1981	<b>Cumulative Energy Availability Factor:</b>	74.2%
<b>Date of Grid Connection:</b>	24 Mar 1981	<b>Cumulative Load Factor:</b>	70.7%
<b>Date of Commercial Operation:</b>	03 Dec 1982	<b>Cumulative Unit Capability Factor:</b>	82.8%
		<b>Cumulative Energy Unavailability Factor:</b>	25.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1982	301.9	411.0	99.4	99.4	99.3	99.3	98.7	98.7	744	100.0
1983	2459.9	411.0	72.0	74.1	72.0	74.1	68.3	70.7	6818	77.8
1984	2830.7	411.0	82.7	78.3	82.7	78.2	78.4	74.4	7610	86.6
1985	2972.6	411.0	86.8	81.0	86.7	81.0	82.6	77.0	7814	89.2
1986	2627.3	411.0	74.1	79.3	74.1	79.3	73.0	76.0	7244	82.7
1987	2837.8	440.0	74.8	78.4	74.8	78.4	73.6	75.5	7024	80.2
1988	2933.2	411.0	81.5	78.9	81.4	78.9	81.2	76.5	7913	90.1
1989	3186.7	411.0	90.5	80.5	87.8	80.1	88.5	78.2	8047	91.9
1990	3256.9	411.0	89.8	81.6	89.7	81.3	90.5	79.7	8022	91.6
1991	2935.2	411.0	79.8	81.4	79.8	81.1	81.5	79.9	7188	82.1
1992	2806.4	411.0	87.9	82.1	87.8	81.8	77.7	79.7	7396	84.2
1993	2548.0	411.0	81.9	82.1	70.5	80.8	70.8	78.9	6833	78.0
1994	2466.0	411.0	70.9	81.2	70.8	79.9	68.5	78.0	6373	72.8
1995	2526.1	411.0	81.0	81.1	80.6	80.0	70.2	77.4	7083	80.9
1996	2327.3	411.0	79.8	81.0	79.8	80.0	64.5	76.5	6928	78.9
1997	2340.5	411.0	78.5	80.9	75.0	79.7	65.0	75.7	7114	81.2
1998	2006.3	411.0	86.3	81.2	56.3	78.2	55.7	74.5	6705	76.5
1999	2140.6	411.0	72.6	80.7	59.9	77.1	59.5	73.6	7040	80.4
2000	2244.7	411.0	87.9	81.1	62.5	76.3	62.2	73.0	7731	88.0
2001	2543.3	411.0	85.3	81.3	70.6	76.0	70.6	72.9	7057	80.6
2002	2742.4	411.0	91.4	81.8	75.9	76.0	76.2	73.0	7909	90.3
2003	2740.7	411.0	83.7	81.9	75.6	76.0	76.1	73.2	7335	83.7
2004	2816.8	411.0	88.1	82.2	77.4	76.1	78.0	73.4	7688	87.5
2005	2059.4	411.0	88.5	82.5	57.6	75.3	57.2	72.7	7672	87.6
2006	2294.6	411.0	90.0	82.8	64.0	74.8	63.7	72.3	7436	84.9
2007	1815.3	411.0	82.9	82.8	50.7	73.9	50.4	71.5	6506	74.3
2008	1876.7	411.0	83.8	82.8	83.8	74.2	52.1	70.7	7405	84.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		5			71	
B. Refuelling without a maintenance outage					0	
C. Inspection, maintenance or repair combined with refuelling	1374			1032		
D. Inspection, maintenance or repair without refuelling				89		
E. Testing of plant systems or component				14	0	
J. Grid limitation, failure or grid unavailability					15	135
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					4	7
L. Human factor related					1	
Subtotal	1374	5	0	1135	91	142
Total		1379			1368	

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		33
15. Reactor Cooling System		10
16. Steam generation system		8
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		7
42. Electrical Power Supply System	5	4
XX. Miscellaneous Systems		0
Total	5	68

## RU-33 KOLA-4

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2793.5 GW(e).h  
**Energy Availability Factor:** 85.1%  
**Load Factor:** 77.6%  
**Operating Factor:** 89.0%  
**Energy Unavailability Factor:** 14.9%  
**Total Off-line Time:** 966 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	243.5	248.2	304.3	297.6	279.4	129.0	0.0	146.9	255.5	289.2	286.4	313.6	2793.5
<b>EAF (%)</b>	100.0	100.0	99.5	100.0	100.0	49.5	3.2	70.9	100.0	100.0	100.0	100.0	85.1
<b>UCF (%)</b>	100.0	100.0	99.5	100.0	100.0	50.0	3.2	70.9	100.0	100.0	100.0	100.0	85.2
<b>LF (%)</b>	79.6	89.9	99.5	100.7	91.4	43.6	0.0	48.0	86.3	94.4	96.8	102.6	77.6
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	90.7	0.0	75.9	100.0	100.0	100.0	100.0	89.0
<b>EUF (%)</b>	0.0	0.0	0.5	0.0	0.0	50.5	96.8	29.1	0.0	0.0	0.0	0.0	14.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	50.0	96.8	29.1	0.0	0.0	0.0	0.0	14.8
<b>UCLF (%)</b>	0.0	0.0	0.5	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	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 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 DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 4380 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.07.03 TO 08.08.08. 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

<b>Date of Construction Start:</b>	01 Aug 1976	<b>Lifetime Generation:</b>	61942.0 GW(e).h
<b>Date of First Criticality:</b>	07 Oct 1984	<b>Cumulative Energy Availability Factor:</b>	73.3%
<b>Date of Grid Connection:</b>	11 Oct 1984	<b>Cumulative Load Factor:</b>	71.4%
<b>Date of Commercial Operation:</b>	06 Dec 1984	<b>Cumulative Unit Capability Factor:</b>	82.0%
		<b>Cumulative Energy Unavailability Factor:</b>	26.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	168.5	411.0	100.0	100.0	100.0	100.0	55.1	55.1	730	98.1
1985	2585.8	411.0	78.2	79.9	78.2	79.9	71.8	70.5	7751	88.5
1986	2690.2	411.0	72.4	76.3	72.4	76.3	74.7	72.5	7230	82.5
1987	3341.2	440.0	85.5	79.4	85.5	79.4	86.7	77.3	7861	89.7
1988	3124.2	411.0	85.0	80.7	84.9	80.7	86.5	79.6	7762	88.4
1989	3111.5	411.0	87.6	82.1	85.8	81.7	86.4	80.9	7793	89.0
1990	2930.4	411.0	80.3	81.8	80.2	81.5	81.4	81.0	7142	81.5
1991	2790.5	411.0	76.7	81.1	76.7	80.8	77.5	80.5	7429	84.8
1992	2764.9	411.0	80.5	81.0	80.0	80.7	76.6	80.0	7253	82.6
1993	2827.0	411.0	92.4	82.2	79.0	80.5	78.5	79.8	8247	94.1
1994	1939.8	411.0	62.7	80.3	55.8	78.1	53.9	77.3	5915	67.5
1995	2288.8	411.0	73.8	79.7	73.8	77.7	63.6	76.1	7022	80.2
1996	2537.7	411.0	84.1	80.1	84.1	78.2	70.3	75.6	7792	88.7
1997	2271.7	411.0	76.2	79.8	74.6	78.0	63.1	74.6	6848	78.2
1998	1927.6	411.0	69.4	79.1	49.2	75.9	53.5	73.1	6336	72.3
1999	2567.5	411.0	82.0	79.3	71.2	75.6	71.3	73.0	7193	82.1
2000	2177.5	411.0	86.3	79.7	60.4	74.7	60.3	72.2	7096	80.8
2001	2447.1	411.0	87.4	80.1	68.0	74.3	68.0	72.0	7149	81.6
2002	2601.7	411.0	79.7	80.1	71.5	74.1	72.3	72.0	7281	83.1
2003	2480.8	411.0	90.9	80.7	68.7	73.8	68.9	71.8	6663	76.1
2004	2391.6	411.0	86.8	81.0	66.4	73.5	66.2	71.6	7863	89.5
2005	2231.7	411.0	90.2	81.4	62.1	72.9	62.0	71.1	7879	89.9
2006	2573.1	411.0	84.1	81.5	71.3	72.9	71.5	71.1	7217	82.4
2007	2584.1	411.0	89.8	81.9	71.5	72.8	71.8	71.2	7640	87.2
2008	2793.5	411.0	85.2	82.0	85.1	73.3	77.6	71.4	7794	89.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					56	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	875			1039	24	
D. Inspection, maintenance or repair without refuelling				88		
E. Testing of plant systems or component				6		
J. Grid limitation, failure or grid unavailability			115			153
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	0
Subtotal	875	0	115	1133	81	153
Total		990			1367	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		11
14. Safety Systems		3
15. Reactor Cooling System		5
16. Steam generation system		7
17. Safety I&C Systems (excluding reactor I&C)		0
32. Feedwater and Main Steam System		7
42. Electrical Power Supply System		17

Total	0	52
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## RU-17 KURSK-1

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6464.6 GW(e).h  
**Energy Availability Factor:** 81.3%  
**Load Factor:** 79.8%  
**Operating Factor:** 86.7%  
**Energy Unavailability Factor:** 18.7%  
**Total Off-line Time:** 1164 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	694.7	630.6	615.2	508.9	647.8	433.4	0.0	371.8	623.9	663.4	655.1	619.8	6464.6
<b>EAF (%)</b>	100.0	96.3	99.9	77.5	94.5	66.2	0.0	55.0	93.4	96.1	98.6	99.9	81.3
<b>UCF (%)</b>	100.0	96.3	99.9	79.4	99.1	77.1	0.0	64.0	100.0	100.0	98.6	99.9	84.4
<b>LF (%)</b>	100.9	101.5	89.4	76.5	94.1	65.1	0.0	54.0	93.7	96.3	98.4	90.1	79.8
<b>OF (%)</b>	100.0	103.6	99.9	91.0	100.0	77.5	0.0	71.0	100.0	100.0	100.0	100.0	86.7
<b>EUF (%)</b>	0.0	3.7	0.1	22.5	5.5	33.8	100.0	45.0	6.6	3.9	1.4	0.1	18.7
<b>PUF (%)</b>	0.0	0.0	0.1	0.0	0.9	22.9	100.0	31.0	0.0	0.0	0.0	0.0	13.1
<b>UCLF (%)</b>	0.0	3.7	0.0	20.6	0.0	0.0	0.0	5.0	0.0	0.0	1.4	0.1	2.5
<b>XUF (%)</b>	0.0	0.0	0.0	1.9	4.6	11.0	0.0	9.0	6.6	3.9	0.0	0.0	3.1

UCLF replaces previously used UUF.

### 4. 2008 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, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 24780 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.06.24 TO 08.08.07. 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

<b>Date of Construction Start:</b>	01 Jun 1972	<b>Lifetime Generation:</b>	151904.0 GW(e).h
<b>Date of First Criticality:</b>	25 Oct 1976	<b>Cumulative Energy Availability Factor:</b>	59.8%
<b>Date of Grid Connection:</b>	19 Dec 1976	<b>Cumulative Load Factor:</b>	59.4%
<b>Date of Commercial Operation:</b>	12 Oct 1977	<b>Cumulative Unit Capability Factor:</b>	61.8%
		<b>Cumulative Energy Unavailability Factor:</b>	40.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	1458.9	925.0	79.1	79.1	79.1	79.1	71.4	71.4	1897	85.9
1978	5058.1	925.0	63.0	66.2	63.0	66.2	62.4	64.2	7573	86.4
1979	5930.2	925.0	73.9	69.7	73.1	69.3	73.2	68.2	7528	85.9
1980	6477.7	925.0	79.9	72.8	79.7	72.5	79.7	71.8	7669	87.3
1981	6132.8	925.0	76.4	73.7	76.4	73.4	75.7	72.7	7885	90.0
1982	7010.4	925.0	85.7	75.9	85.7	75.7	86.5	75.3	7788	88.9
1983	6720.3	925.0	82.2	76.9	82.2	76.8	82.9	76.5	7456	85.1
1984	6660.0	925.0	81.4	77.6	81.4	77.4	82.0	77.3	7369	83.9
1985	6346.8	925.0	76.9	77.5	76.8	77.3	78.3	77.4	7186	82.0
1986	5675.8	925.0	69.2	76.6	69.2	76.5	70.0	76.6	6598	75.3
1987	7022.7	1000.0	82.6	77.2	82.6	77.1	80.2	77.0	7407	84.6
1988	6638.0	925.0	81.7	77.6	81.7	77.5	81.7	77.4	7350	83.7
1989	5745.4	925.0	68.3	76.9	68.3	76.8	70.9	76.9	6582	75.1
1990	5090.5	925.0	65.7	76.0	65.7	75.9	62.8	75.8	6817	77.8
1991	4163.1	925.0	53.5	74.4	52.5	74.3	51.4	74.1	7038	80.3
1992	3669.2	925.0	46.3	72.6	46.3	72.5	45.2	72.2	6103	69.5
1993	4809.4	925.0	91.6	73.8	61.8	71.8	59.4	71.4	8145	93.0
1994	1560.6	925.0	20.6	70.7	19.8	68.8	19.3	68.4	2686	30.7
1995	0.0	925.0	0.0	66.8	0.0	65.1	0.0	64.7	0	0.0
1996	0.0	925.0	0.0	63.4	0.0	61.7	0.0	61.3	0	0.0
1997	27.8	925.0	0.5	60.3	0.5	58.7	0.3	58.3	61	0.7
1998	4508.6	925.0	59.3	60.2	57.4	58.6	55.6	58.2	7845	89.6
1999	4557.0	925.0	58.7	60.2	57.6	58.6	56.2	58.1	7464	85.2
2000	3449.7	925.0	44.3	59.5	43.6	57.9	42.5	57.5	5531	63.0
2001	1296.1	925.0	16.6	57.7	16.4	56.2	16.0	55.8	2042	23.3
2002	2462.7	925.0	32.5	56.7	30.8	55.2	30.4	54.8	3439	39.3
2003	6452.7	925.0	80.2	57.6	78.9	56.1	79.6	55.7	7262	82.9
2004	6601.3	925.0	83.0	58.6	81.1	57.0	81.2	56.6	7363	83.8
2005	6220.0	925.0	83.0	59.4	77.0	57.7	76.8	57.3	7651	87.3
2006	5837.7	925.0	78.4	60.1	72.2	58.2	72.0	57.8	7089	80.9
2007	6736.2	925.0	89.1	61.0	82.8	59.0	83.1	58.7	7670	87.6
2008	6464.6	925.0	84.4	61.8	81.3	59.8	79.8	59.4	7596	86.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		64			67	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1058			533	1	
D. Inspection, maintenance or repair without refuelling				1708	15	
E. Testing of plant systems or component				5		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				162		
H. Nuclear regulatory requirement					11	
J. Grid limitation, failure or grid unavailability					0	5
L. Human factor related		66			1	
Z. Others					4	
Subtotal	1058	130	0	2408	101	5
Total		1188			2514	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		19
13. Reactor Auxiliary Systems		1
15. Reactor Cooling System		15
16. Steam generation system		3
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System	64	2
35. All other I&C Systems		1
41. Main Generator System		1
42. Electrical Power Supply System		5
Total	64	53

## RU-22 KURSK-2

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6835.7 GW(e).h  
**Energy Availability Factor:** 82.6%  
**Load Factor:** 84.4%  
**Operating Factor:** 83.9%  
**Energy Unavailability Factor:** 17.4%  
**Total Off-line Time:** 1409 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	704.8	662.7	685.2	0.0	0.7	661.9	704.4	693.1	682.8	715.4	702.6	622.2	6835.7
<b>EAF (%)</b>	100.0	98.2	98.4	0.3	1.3	98.5	100.0	99.0	99.4	99.6	100.0	96.4	82.6
<b>UCF (%)</b>	100.0	98.2	98.4	0.3	1.3	98.8	100.0	99.0	99.4	99.6	100.0	96.4	82.6
<b>LF (%)</b>	102.4	106.6	99.6	0.0	0.1	99.4	102.3	100.7	102.5	103.8	105.5	90.4	84.4
<b>OF (%)</b>	100.0	103.6	99.9	0.7	3.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.9
<b>EUF (%)</b>	0.0	1.8	1.6	99.7	98.7	1.5	0.0	1.0	0.6	0.4	0.0	3.6	17.4
<b>PUF (%)</b>	0.0	0.0	0.0	99.7	98.7	1.2	0.0	1.0	0.0	0.0	0.0	0.0	16.7
<b>UCLF (%)</b>	0.0	1.8	1.6	0.0	0.0	0.0	0.0	0.0	0.6	0.4	0.0	3.6	0.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 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, JUNE - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 183152 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 08.04.01 TO 08.05.30. 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

<b>Date of Construction Start:</b>	01 Jan 1973	<b>Lifetime Generation:</b>	148707.0 GW(e).h
<b>Date of First Criticality:</b>	16 Dec 1978	<b>Cumulative Energy Availability Factor:</b>	62.2%
<b>Date of Grid Connection:</b>	28 Jan 1979	<b>Cumulative Load Factor:</b>	61.8%
<b>Date of Commercial Operation:</b>	17 Aug 1979	<b>Cumulative Unit Capability Factor:</b>	64.7%
		<b>Cumulative Energy Unavailability Factor:</b>	37.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	2303.9	925.0	67.7	67.7	67.7	67.7	67.8	67.8	3070	83.6
1980	6404.3	925.0	79.0	75.7	78.4	75.3	78.8	75.6	7658	87.2
1981	6385.9	925.0	78.7	76.9	78.7	76.7	78.8	76.9	7874	89.9
1982	5875.8	925.0	71.1	75.2	71.1	75.1	72.5	75.6	6443	73.6
1983	5707.6	925.0	70.1	74.1	70.1	73.9	70.4	74.5	7104	81.1
1984	6326.5	925.0	77.1	74.6	77.1	74.5	77.9	75.1	7219	82.2
1985	6459.9	925.0	79.4	75.4	79.4	75.3	79.7	75.8	7598	86.7
1986	5617.3	925.0	69.1	74.5	69.1	74.4	69.3	74.9	6575	75.1
1987	7196.7	1000.0	83.3	75.6	83.3	75.6	82.2	75.9	7539	86.1
1988	5725.7	925.0	73.9	75.5	73.9	75.4	70.5	75.3	6609	75.2
1989	6164.2	925.0	74.9	75.4	74.9	75.3	76.1	75.4	6797	77.6
1990	4789.7	925.0	62.2	74.3	62.2	74.2	59.1	73.9	6874	78.5
1991	4376.0	925.0	56.3	72.8	55.3	72.7	54.0	72.4	7361	84.0
1992	2158.4	925.0	27.2	69.4	27.2	69.3	26.6	69.0	3552	40.4
1993	4438.2	925.0	85.0	70.5	57.1	68.5	54.8	68.0	7432	84.8
1994	4212.2	925.0	55.3	69.5	53.5	67.5	52.0	66.9	7385	84.3
1995	4745.4	925.0	90.8	70.8	59.8	67.0	58.6	66.4	7708	88.0
1996	4196.1	925.0	52.8	69.8	52.7	66.2	51.6	65.6	7099	80.8
1997	4354.3	925.0	55.3	69.0	54.9	65.6	53.7	65.0	7076	80.8
1998	1685.1	925.0	21.7	66.6	21.3	63.3	20.8	62.7	2805	32.0
1999	3708.1	925.0	48.0	65.7	46.8	62.5	45.8	61.9	6066	69.2
2000	3668.1	925.0	48.9	64.9	46.2	61.8	45.1	61.1	6211	70.7
2001	4768.1	925.0	61.1	64.7	60.1	61.7	58.8	61.0	7667	87.5
2002	3027.8	925.0	38.3	63.6	38.1	60.7	37.4	60.0	4770	54.5
2003	3756.2	925.0	47.1	62.9	46.4	60.1	46.4	59.4	5834	66.6
2004	3692.1	925.0	45.1	62.2	45.0	59.5	45.4	58.9	4318	49.2
2005	6896.6	925.0	87.5	63.2	84.7	60.5	85.1	59.9	7782	88.8
2006	6574.4	925.0	82.9	63.9	80.3	61.2	81.1	60.6	7320	83.6
2007	5728.7	925.0	70.0	64.1	69.5	61.5	70.7	61.0	6207	70.9
2008	6835.7	925.0	82.6	64.7	82.6	62.2	84.4	61.8	7351	83.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1979 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					104	
B. Refuelling without a maintenance outage					2	
C. Inspection, maintenance or repair combined with refuelling	1433			873		
D. Inspection, maintenance or repair without refuelling				860	19	
E. Testing of plant systems or component				5		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				137		
J. Grid limitation, failure or grid unavailability					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					40	
L. Human factor related					2	
Subtotal	1433	0	0	1875	168	0
Total	1433			2043		

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

System	2008 Hours Lost	1979 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		54
12. Reactor I&C Systems		10
13. Reactor Auxiliary System:		6
14. Safety Systems		2
15. Reactor Cooling System:		15
16. Steam generation system:		4
17. Safety I&C Systems (excluding reactor I&C)		2
32. Feedwater and Main Steam System		4
41. Main Generator System:		2
42. Electrical Power Supply System:		1
Total	0	100

## RU-38 KURSK-3

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2117.4 GW(e).h  
**Energy Availability Factor:** 26.6%  
**Load Factor:** 26.1%  
**Operating Factor:** 27.1%  
**Energy Unavailability Factor:** 73.4%  
**Total Off-line Time:** 6386 hours

### 3. 2008 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	149.0	690.4	671.5	606.4	2117.4
<b>EAF (%)</b>	0.0	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	24.7	98.3	97.4	100.0	26.6
<b>UCF (%)</b>	0.0	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	24.7	98.4	97.4	100.0	26.6
<b>LF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.4	100.2	100.8	88.1	26.1
<b>OF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.6	100.0	100.0	84.8	27.1
<b>EUF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	75.3	1.7	2.6	0.0	73.4
<b>PUF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	75.3	0.0	0.0	0.0	73.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.6	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. 2008 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 OCTOBER, NOVEMBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 66237 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 08.01.01 TO 08.09.19 INVOLVING PARTIAL FUEL CHANNEL REPLACEMENT. 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

<b>Date of Construction Start:</b>	01 Apr 1978	<b>Lifetime Generation:</b>	141728.0 GW(e).h
<b>Date of First Criticality:</b>	09 Aug 1983	<b>Cumulative Energy Availability Factor:</b>	70.4%
<b>Date of Grid Connection:</b>	17 Oct 1983	<b>Cumulative Load Factor:</b>	69.6%
<b>Date of Commercial Operation:</b>	30 Mar 1984	<b>Cumulative Unit Capability Factor:</b>	71.6%
		<b>Cumulative Energy Unavailability Factor:</b>	29.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	4811.2	925.0	75.0	75.0	75.0	75.0	70.8	70.8	5800	79.0
1985	6260.8	925.0	77.9	76.6	77.6	76.4	77.3	74.3	7250	82.8
1986	4810.8	925.0	60.4	70.9	60.0	70.6	59.4	69.1	6269	71.6
1987	5458.9	1000.0	69.0	70.4	66.4	69.5	62.3	67.2	6185	70.6
1988	6693.6	925.0	83.6	73.1	83.6	72.4	82.4	70.3	7471	85.1
1989	5900.5	925.0	74.3	73.3	74.3	72.7	72.8	70.7	7200	82.2
1990	6889.4	925.0	86.5	75.2	86.5	74.7	85.0	72.8	8096	92.4
1991	5139.0	925.0	63.4	73.7	63.2	73.2	63.4	71.6	5704	65.1
1992	6630.5	925.0	82.1	74.7	82.1	74.2	81.6	72.7	8126	92.5
1993	5562.3	925.0	71.2	74.3	70.3	73.8	68.6	72.3	6438	73.5
1994	5077.9	925.0	73.6	74.2	66.7	73.2	62.7	71.4	6495	74.1
1995	5318.1	925.0	65.7	73.5	65.4	72.5	65.6	70.9	5974	68.2
1996	6739.3	925.0	82.9	74.3	82.7	73.3	82.9	71.9	7383	84.1
1997	6548.7	925.0	82.5	74.8	81.6	73.9	80.8	72.5	7325	83.6
1998	4528.3	925.0	60.3	73.9	56.5	72.7	55.9	71.4	5405	61.7
1999	6006.9	925.0	75.3	74.0	74.3	72.8	74.1	71.6	6749	77.0
2000	6382.3	925.0	78.8	74.2	78.3	73.2	78.5	72.0	7415	84.4
2001	3535.2	925.0	44.7	72.6	43.5	71.5	43.6	70.4	3948	45.1
2002	6699.8	925.0	88.2	73.4	85.1	72.2	82.7	71.1	7788	88.9
2003	5100.6	925.0	62.2	72.9	61.8	71.7	62.9	70.6	5469	62.4
2004	6894.2	925.0	86.3	73.5	84.3	72.3	84.8	71.3	7660	87.2
2005	4987.1	925.0	63.5	73.1	61.3	71.8	61.5	70.9	5598	63.9
2006	6711.2	925.0	83.4	73.5	81.9	72.3	82.8	71.4	7353	83.9
2007	5765.3	925.0	73.7	73.5	71.1	72.2	71.1	71.4	6535	74.6
2008	2117.4	925.0	26.6	71.6	26.6	70.4	26.1	69.6	2374	27.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		0			139	
C. Inspection, maintenance or repair combined with refuelling				1059		
D. Inspection, maintenance or repair without refuelling	6295			769		
J. Grid limitation, failure or grid unavailability			112		1	2
Subtotal	6295	0	112	1828	140	2
Total	6407			1970		

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		22
12. Reactor I&C Systems		4
13. Reactor Auxiliary System:		4
14. Safety Systems		16
15. Reactor Cooling System:		62
16. Steam generation system:		
17. Safety I&C Systems (excluding reactor I&C)	0	3
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		9
41. Main Generator System:		1
42. Electrical Power Supply System:		4
Total	0	128



## RU-39 KURSK-4

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6052.4 GW(e).h  
**Energy Availability Factor:** 73.9%  
**Load Factor:** 74.7%  
**Operating Factor:** 75.1%  
**Energy Unavailability Factor:** 26.1%  
**Total Off-line Time:** 2180 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	696.1	657.2	699.0	671.2	694.9	649.0	666.7	661.2	657.0	0.0	0.0	0.0	6052.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	99.7	97.4	96.8	96.3	98.6	0.5	0.0	0.0	73.9
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	99.8	100.0	100.0	0.5	0.0	0.0	74.8
<b>LF (%)</b>	101.2	105.7	101.6	100.9	101.0	97.4	96.9	96.1	98.6	0.0	0.0	0.0	74.7
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	0.7	0.0	0.0	75.1
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.3	2.6	3.2	3.7	1.4	99.5	100.0	100.0	26.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	99.5	100.0	100.0	25.2
<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	0.3	2.6	3.0	3.7	1.4	0.0	0.0	0.0	0.9

UCLF replaces previously used UUF.

### 4. 2008 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, SEPTEMBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 44890 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 08.10.01 TO 08.12.31 INVOLVING PARTIAL FUEL CHANNEL REPLACEMENT. 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

<b>Date of Construction Start:</b>	01 May 1981	<b>Lifetime Generation:</b>	141709.0 GW(e).h
<b>Date of First Criticality:</b>	31 Oct 1985	<b>Cumulative Energy Availability Factor:</b>	75.8%
<b>Date of Grid Connection:</b>	02 Dec 1985	<b>Cumulative Load Factor:</b>	75.9%
<b>Date of Commercial Operation:</b>	05 Feb 1986	<b>Cumulative Unit Capability Factor:</b>	77.1%
		<b>Cumulative Energy Unavailability Factor:</b>	24.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	5952.3	925.0	80.8	80.8	80.4	80.4	80.3	80.3	7059	88.1
1987	6167.7	1000.0	72.4	76.3	72.3	76.0	70.4	74.9	6704	76.5
1988	6653.0	925.0	81.7	78.1	81.7	77.9	81.9	77.3	7390	84.1
1989	6131.8	925.0	76.0	77.6	76.0	77.4	75.7	76.9	6954	79.4
1990	6050.0	925.0	73.7	76.8	73.6	76.7	74.7	76.4	6922	79.0
1991	7356.1	925.0	92.5	79.4	90.3	78.9	90.8	78.8	8469	96.7
1992	6117.4	925.0	75.4	78.9	75.4	78.4	75.3	78.3	7324	83.4
1993	5638.3	925.0	71.7	78.0	71.0	77.5	69.6	77.2	6439	73.5
1994	5369.4	925.0	71.5	77.3	67.0	76.3	66.3	76.0	6255	71.4
1995	6207.5	925.0	78.6	77.4	77.0	76.4	76.6	76.1	7001	79.9
1996	6590.2	925.0	81.4	77.8	80.2	76.7	81.1	76.5	7373	83.9
1997	5971.7	925.0	73.9	77.4	73.1	76.4	73.7	76.3	6664	76.1
1998	6641.4	925.0	86.7	78.1	82.3	76.9	82.0	76.7	7751	88.5
1999	5895.4	925.0	74.2	77.9	72.8	76.6	72.8	76.4	6595	75.3
2000	6778.8	925.0	83.5	78.2	82.8	77.0	83.4	76.9	7423	84.5
2001	6671.6	925.0	82.2	78.5	81.5	77.3	82.3	77.2	7281	83.1
2002	5531.0	925.0	68.3	77.9	67.6	76.7	68.3	76.7	6094	69.6
2003	6233.4	925.0	77.3	77.8	75.8	76.7	76.9	76.7	6802	77.6
2004	5422.9	925.0	68.0	77.3	66.7	76.1	66.7	76.2	6005	68.4
2005	7081.1	925.0	89.4	77.9	87.1	76.7	87.4	76.8	7858	89.7
2006	3636.4	925.0	44.8	76.4	44.2	75.2	44.9	75.2	4115	47.0
2007	7426.5	925.0	94.3	77.2	91.2	75.9	91.7	76.0	8298	94.7
2008	6052.4	925.0	74.8	77.1	73.9	75.8	74.7	75.9	6580	75.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					52	
B. Refuelling without a maintenance outage					4	
C. Inspection, maintenance or repair combined with refuelling	2204			909		
D. Inspection, maintenance or repair without refuelling				612		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				118		
J. Grid limitation, failure or grid unavailability					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					8	
Subtotal	2204	0	0	1639	65	0
Total	2204			1704		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		1
15. Reactor Cooling System		13
32. Feedwater and Main Steam System		10
42. Electrical Power Supply System		23
Total	0	49

## RU-15 LENINGRAD-1

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 5848.7 GW(e).h  
**Energy Availability Factor:** 72.5%  
**Load Factor:** 72.2%  
**Operating Factor:** 73.3%  
**Energy Unavailability Factor:** 27.5%  
**Total Off-line Time:** 2339 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	708.9	652.4	704.1	665.3	491.5	0.0	0.0	86.9	680.8	700.1	595.8	563.1	5848.7
<b>EAF (%)</b>	100.0	98.8	99.9	100.0	70.2	0.0	0.0	13.5	100.0	100.0	100.0	90.8	72.5
<b>UCF (%)</b>	100.0	98.8	99.9	100.0	70.2	0.0	0.0	13.5	100.0	100.0	100.0	90.9	72.5
<b>LF (%)</b>	103.0	104.9	102.3	100.0	71.4	0.0	0.0	12.6	102.2	101.6	89.5	81.8	72.2
<b>OF (%)</b>	100.0	103.6	99.9	100.1	71.1	0.0	0.0	16.3	100.0	100.0	100.0	91.8	73.3
<b>EUF (%)</b>	0.0	1.2	0.1	0.0	29.8	100.0	100.0	86.5	0.0	0.0	0.0	9.2	27.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	29.7	100.0	100.0	0.0	0.0	0.0	0.0	0.0	19.2
<b>UCLF (%)</b>	0.0	1.2	0.1	0.0	0.1	0.0	0.0	86.5	0.0	0.0	0.0	9.2	8.2
<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. 2008 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 - OCTOBER, DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 119072 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 08.03.23 TO 08.05.26 INVOLVING PARTIAL FUEL CHANNEL REPLACEMENT. ONE UNIT SHUTDOWN OCCURRED DUE TO PERSONNEL ERRORS. 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

<b>Date of Construction Start:</b>	01 Mar 1970	<b>Lifetime Generation:</b>	194192.0 GW(e).h
<b>Date of First Criticality:</b>	12 Sep 1973	<b>Cumulative Energy Availability Factor:</b>	69.6%
<b>Date of Grid Connection:</b>	21 Dec 1973	<b>Cumulative Load Factor:</b>	69.2%
<b>Date of Commercial Operation:</b>	01 Nov 1974	<b>Cumulative Unit Capability Factor:</b>	70.3%
		<b>Cumulative Energy Unavailability Factor:</b>	30.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	1022.6	925.0	76.5	76.5	76.5	76.5	75.5	75.5	1378	94.1
1975	3998.9	925.0	50.6	54.3	50.6	54.3	49.4	53.1	6661	76.0
1976	4098.2	925.0	51.5	53.0	51.5	53.0	50.4	51.9	6137	69.9
1977	5941.8	925.0	74.1	59.7	74.1	59.7	73.3	58.6	8192	93.5
1978	5413.7	925.0	67.3	61.5	67.3	61.5	66.8	60.6	6735	76.9
1979	6322.0	925.0	78.7	64.8	78.7	64.8	78.0	64.0	7973	91.0
1980	5542.1	925.0	68.5	65.4	68.3	65.4	68.2	64.7	6574	74.8
1981	6414.7	925.0	79.8	67.4	79.5	67.4	79.2	66.7	8018	91.5
1982	5709.6	925.0	70.8	67.8	70.8	67.8	70.5	67.1	6665	76.1
1983	7164.8	925.0	88.0	70.0	87.5	69.9	88.4	69.5	7803	89.1
1984	6650.1	925.0	82.0	71.2	81.7	71.1	81.8	70.7	7321	83.3
1985	7008.1	925.0	86.5	72.6	86.3	72.5	86.5	72.1	8059	92.0
1986	5924.1	925.0	73.3	72.6	73.3	72.5	73.1	72.2	6677	76.2
1987	8113.0	1000.0	93.5	74.3	92.7	74.2	92.6	73.8	8255	94.2
1988	6620.3	925.0	81.7	74.9	81.7	74.7	81.5	74.4	7519	85.6
1989	4577.0	925.0	56.4	73.6	56.0	73.5	56.5	73.2	4993	57.0
1990	0.0	925.0	0.0	69.1	0.0	69.0	0.0	68.7	0	0.0
1991	3934.0	925.0	49.9	68.0	49.9	67.8	48.5	67.5	6385	72.9
1992	7191.6	925.0	88.6	69.1	88.1	69.0	88.5	68.7	7995	91.0
1993	6520.4	925.0	83.5	69.9	81.7	69.6	80.5	69.3	7354	83.9
1994	5531.2	925.0	77.7	70.3	77.6	70.0	68.3	69.3	6956	79.4
1995	0.0	925.0	0.0	67.0	0.0	66.7	0.0	66.0	0	0.0
1996	3852.8	925.0	47.6	66.1	47.5	65.9	47.4	65.2	4454	50.7
1997	6872.4	925.0	88.6	67.1	86.1	66.7	84.8	66.0	7785	88.9
1998	5630.3	925.0	69.8	67.2	68.8	66.8	69.5	66.1	6220	71.0
1999	6637.9	925.0	81.8	67.7	81.3	67.4	81.9	66.8	7431	84.8
2000	6317.8	925.0	78.5	68.2	77.2	67.8	77.8	67.2	7069	80.5
2001	7097.8	925.0	89.2	68.9	87.4	68.5	87.6	67.9	7923	90.4
2002	5824.6	925.0	72.4	69.1	71.2	68.6	71.9	68.1	7104	81.1
2003	7446.3	925.0	95.0	69.9	92.2	69.4	91.9	68.9	8495	97.0
2004	1328.5	925.0	18.2	68.2	16.7	67.6	16.4	67.2	1715	19.5
2005	7145.4	925.0	93.5	69.0	88.5	68.3	88.2	67.8	8255	94.2
2006	6802.1	925.0	83.9	69.5	83.9	68.8	83.9	68.3	7651	87.3
2007	7538.3	925.0	93.1	70.2	92.0	69.5	93.0	69.1	8306	94.8
2008	5848.7	925.0	72.5	70.3	72.5	69.6	72.2	69.2	6421	73.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					106	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	1680			988		
D. Inspection, maintenance or repair without refuelling				690	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling		624		7		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				193		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					6	
L. Human factor related		70				
Subtotal	1680	694	0	1878	119	0
Total	2374			1997		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		18
14. Safety Systems		7
15. Reactor Cooling System		33
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		4
35. All other I&C Systems		2
41. Main Generator System		2
42. Electrical Power Supply System		2
Total	0	72

## RU-16 LENINGRAD-2

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7017.5 GW(e).h  
**Energy Availability Factor:** 88.0%  
**Load Factor:** 86.6%  
**Operating Factor:** 89.2%  
**Energy Unavailability Factor:** 12.0%  
**Total Off-line Time:** 950 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	627.1	660.6	701.9	685.6	681.4	635.7	666.6	685.9	677.3	96.7	277.4	621.4	7017.5
<b>EAF (%)</b>	99.6	100.0	99.4	100.0	99.8	97.6	97.3	98.8	99.8	14.6	50.9	99.6	88.0
<b>UCF (%)</b>	99.6	100.0	99.4	100.0	99.8	98.2	98.8	99.1	99.9	14.6	50.9	99.6	88.2
<b>LF (%)</b>	91.1	106.3	102.0	103.1	99.0	95.5	96.9	99.7	101.7	14.0	41.6	90.3	86.6
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	15.0	52.6	100.0	89.2
<b>EUF (%)</b>	0.4	0.0	0.6	0.0	0.2	2.4	2.7	1.2	0.2	85.4	49.1	0.4	12.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.4	49.1	0.0	11.3
<b>UCLF (%)</b>	0.4	0.0	0.6	0.0	0.2	1.8	1.2	1.0	0.1	0.0	0.0	0.4	0.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.6	1.5	0.2	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 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 94844 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.10.05 TO 08.11.16. 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  
**Date of First Criticality:** 06 May 1975  
**Date of Grid Connection:** 11 Jul 1975  
**Date of Commercial Operation:** 11 Feb 1976

**Lifetime Generation:** 187486.0 GW(e).h  
**Cumulative Energy Availability Factor:** 69.7%  
**Cumulative Load Factor:** 69.5%  
**Cumulative Unit Capability Factor:** 70.6%  
**Cumulative Energy Unavailability Factor:** 30.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976	4873.3	925.0	67.9	67.9	67.9	67.9	65.5	65.5	6910	85.9
1977	5413.7	925.0	67.2	67.5	67.1	67.5	66.8	66.2	7337	83.8
1978	6310.8	925.0	78.8	71.4	78.8	71.3	77.9	70.2	8008	91.4
1979	5633.7	925.0	70.1	71.0	70.1	71.0	69.5	70.0	6954	79.4
1980	6351.8	925.0	78.8	72.6	78.6	72.6	78.2	71.7	7960	90.6
1981	5177.2	925.0	62.0	70.8	62.0	70.8	63.9	70.4	6057	69.1
1982	7266.8	925.0	90.4	73.7	89.9	73.5	89.7	73.2	8125	92.8
1983	6790.8	925.0	84.2	75.0	83.6	74.8	83.8	74.5	7479	85.4
1984	7145.9	925.0	87.6	76.4	87.4	76.2	87.9	76.0	7881	89.7
1985	5962.6	925.0	74.4	76.2	74.3	76.0	73.6	75.8	6604	75.4
1986	7152.3	925.0	88.4	77.3	88.1	77.1	88.3	76.9	7914	90.3
1987	7228.2	1000.0	83.7	77.9	83.0	77.7	82.5	77.4	7513	85.8
1988	6814.9	925.0	83.6	78.3	83.6	78.1	83.9	77.9	7417	84.4
1989	6111.5	925.0	75.8	78.2	75.6	77.9	75.4	77.7	7102	81.1
1990	5998.3	925.0	75.5	78.0	75.3	77.8	74.0	77.5	8125	92.8
1991	4410.8	925.0	56.4	76.6	56.3	76.4	54.4	76.1	7204	82.2
1992	0.0	925.0	0.0	72.1	0.0	71.9	0.0	71.6	0	0.0
1993	0.0	925.0	0.0	68.1	0.0	67.9	0.0	67.6	0	0.0
1994	164.1	925.0	2.3	64.6	2.3	64.5	2.0	64.1	660	7.5
1995	6812.0	925.0	93.4	66.1	86.2	65.6	84.1	65.1	8280	94.5
1996	7244.9	925.0	89.4	67.2	89.1	66.7	89.2	66.3	7922	90.2
1997	6587.1	925.0	83.1	67.9	82.6	67.4	81.3	67.0	7342	83.8
1998	5916.7	925.0	73.4	68.2	72.5	67.6	73.0	67.2	6643	75.8
1999	6557.8	925.0	80.6	68.7	80.2	68.1	80.9	67.8	7299	83.3
2000	7252.5	925.0	90.1	69.5	88.6	69.0	89.3	68.7	7972	90.8
2001	7073.5	925.0	88.5	70.3	86.6	69.6	87.3	69.4	7904	90.2
2002	7024.9	925.0	88.7	70.9	86.6	70.3	86.7	70.0	7961	90.9
2003	7134.4	925.0	90.9	71.7	88.0	70.9	88.0	70.7	8298	94.7
2004	6711.5	925.0	86.4	72.2	82.9	71.3	82.6	71.1	7832	89.2
2005	3763.2	925.0	50.1	71.4	46.6	70.5	46.4	70.3	4557	52.0
2006	1461.4	925.0	18.1	69.7	18.1	68.8	18.0	68.6	1760	20.1
2007	6461.4	925.0	80.1	70.0	79.0	69.1	79.7	68.9	7077	80.8
2008	7017.5	925.0	88.2	70.6	88.0	69.7	86.6	69.5	7810	89.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					79	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	1000			695		
D. Inspection, maintenance or repair without refuelling				969	8	
E. Testing of plant systems or component				3	1	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				334		
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Subtotal	1000	0	0	2001	91	1
Total	1000			2093		

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		7
13. Reactor Auxiliary System:		6
15. Reactor Cooling System:		18
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		2
35. All other I&C Systems:		1
42. Electrical Power Supply System:		4
Total	0	53



## RU-34 LENINGRAD-3

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 5013.6 GW(e).h  
**Energy Availability Factor:** 62.6%  
**Load Factor:** 61.9%  
**Operating Factor:** 64.3%  
**Energy Unavailability Factor:** 37.4%  
**Total Off-line Time:** 3128 hours

### 3. 2008 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	347.7	661.9	683.0	666.5	670.0	692.8	644.2	647.7	5013.6
<b>EAF (%)</b>	0.0	-3.6	0.1	-0.1	52.9	99.8	99.9	97.4	100.0	99.6	100.0	100.0	62.6
<b>UCF (%)</b>	0.0	-3.6	0.1	-0.1	52.9	99.8	100.0	97.7	100.0	99.6	100.0	100.0	62.6
<b>LF (%)</b>	0.0	0.0	0.0	0.0	50.5	99.4	99.2	96.8	100.6	100.5	96.7	94.1	61.9
<b>OF (%)</b>	0.0	0.0	0.0	0.0	66.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	64.3
<b>EUF (%)</b>	100.0	103.6	99.9	100.1	47.1	0.2	0.1	2.6	0.0	0.4	0.0	0.0	37.4
<b>PUF (%)</b>	100.0	103.6	99.9	55.8	1.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	29.7
<b>UCLF (%)</b>	0.0	0.0	0.0	44.3	45.3	0.0	0.0	2.4	0.0	0.4	0.0	0.0	7.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 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 MAY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 49067 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 08.01.01 TO 08.04.17 INVOLVING PARTIAL FUEL CHANNEL REPLACEMENT. 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

<b>Date of Construction Start:</b>	01 Dec 1973	<b>Lifetime Generation:</b>	160615.0 GW(e).h
<b>Date of First Criticality:</b>	17 Sep 1979	<b>Cumulative Energy Availability Factor:</b>	69.3%
<b>Date of Grid Connection:</b>	07 Dec 1979	<b>Cumulative Load Factor:</b>	68.2%
<b>Date of Commercial Operation:</b>	29 Jun 1980	<b>Cumulative Unit Capability Factor:</b>	70.4%
		<b>Cumulative Energy Unavailability Factor:</b>	30.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	3623.6	925.0	77.4	77.4	77.4	77.4	76.3	76.3	4488	87.4
1981	6553.6	925.0	81.7	80.1	81.3	79.9	80.9	79.2	7528	85.9
1982	6413.3	925.0	80.8	80.4	80.3	80.0	79.1	79.2	7448	85.0
1983	5708.4	925.0	71.3	77.8	70.9	77.5	70.4	76.7	6809	77.7
1984	7214.9	925.0	89.8	80.4	89.2	80.1	88.8	79.4	8060	91.8
1985	6831.9	925.0	85.4	81.3	84.9	80.9	84.3	80.3	7835	89.4
1986	6890.9	925.0	86.4	82.1	85.9	81.7	85.0	81.0	7935	90.6
1987	6010.3	1000.0	70.4	80.5	69.4	79.9	68.6	79.2	6362	72.6
1988	6951.7	925.0	86.5	81.2	86.5	80.7	85.6	80.0	7885	89.8
1989	6938.1	925.0	86.2	81.7	85.9	81.2	85.6	80.6	7455	85.1
1990	7531.9	925.0	93.0	82.7	92.4	82.3	93.0	81.7	8280	94.5
1991	6506.6	925.0	80.6	82.6	80.6	82.1	80.3	81.6	7197	82.2
1992	5516.6	925.0	68.5	81.4	68.4	81.0	67.9	80.5	6122	69.7
1993	7143.8	925.0	90.1	82.1	88.9	81.6	88.2	81.1	7966	90.9
1994	6631.8	925.0	92.4	82.8	91.0	82.3	81.8	81.1	8135	92.9
1995	3586.0	925.0	49.4	80.7	46.5	80.0	44.3	78.8	4332	49.5
1996	0.0	925.0	0.0	75.8	0.0	75.2	0.0	74.0	0	0.0
1997	0.0	925.0	0.0	71.5	0.0	70.9	0.0	69.8	0	0.0
1998	1386.5	925.0	17.5	68.6	17.4	68.1	17.1	67.0	1610	18.4
1999	7853.1	925.0	99.7	70.2	97.1	69.5	96.9	68.5	8701	99.3
2000	6352.8	925.0	79.6	70.7	78.2	70.0	78.2	69.0	7169	81.6
2001	6173.5	925.0	78.9	71.0	76.6	70.3	76.2	69.3	7007	80.0
2002	2514.7	925.0	33.6	69.4	31.9	68.6	31.0	67.7	3332	38.0
2003	6729.2	925.0	86.6	70.1	84.5	69.2	83.0	68.3	8100	92.5
2004	6909.1	925.0	90.9	71.0	86.5	69.9	85.0	69.0	8426	95.9
2005	4447.3	925.0	61.5	70.6	61.1	69.6	54.9	68.4	5397	61.6
2006	7332.1	925.0	89.9	71.3	89.9	70.4	90.5	69.3	8274	94.5
2007	3756.0	925.0	54.1	70.7	47.0	69.5	46.4	68.4	4820	55.0
2008	5013.6	925.0	62.6	70.4	62.6	69.3	61.9	68.2	5632	64.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		60			53	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	2567			547		
D. Inspection, maintenance or repair without refuelling				1315		
E. Testing of plant systems or component		681				
F. Major back-fitting, refurbishment or upgrading activities with refuelling				180		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				110		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	7
Subtotal	2567	741	0	2152	57	7
Total		3308			2216	

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		10
14. Safety Systems		1
15. Reactor Cooling System:		8
16. Steam generation system:	60	
17. Safety I&C Systems (excluding reactor I&C)		8
31. Turbine and auxiliaries:		6
32. Feedwater and Main Steam System		1
41. Main Generator System:		2
42. Electrical Power Supply System:		12
Total	60	48

## RU-35 LENINGRAD-4

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7526.2 GW(e).h  
**Energy Availability Factor:** 94.7%  
**Load Factor:** 92.9%  
**Operating Factor:** 99.5%  
**Energy Unavailability Factor:** 5.3%  
**Total Off-line Time:** 46 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	699.0	636.4	665.7	643.3	499.1	647.4	672.3	652.4	558.4	644.8	638.2	569.3	7526.2
<b>EAF (%)</b>	99.9	98.2	96.1	96.4	73.6	98.2	99.1	96.2	85.4	93.3	100.0	100.0	94.7
<b>UCF (%)</b>	99.9	98.2	96.1	96.4	73.6	98.5	100.0	97.2	85.9	93.3	100.0	100.0	94.9
<b>LF (%)</b>	101.6	102.4	96.7	96.7	72.5	97.2	97.7	94.8	83.8	93.6	95.8	82.7	92.9
<b>OF (%)</b>	100.0	103.6	99.9	100.1	90.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5
<b>EUF (%)</b>	0.1	1.8	3.9	3.6	26.4	1.8	0.9	3.8	14.6	6.7	0.0	0.0	5.3
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	26.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2
<b>UCLF (%)</b>	0.1	1.8	3.9	3.6	0.0	1.5	0.0	2.8	14.1	6.7	0.0	0.0	2.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.3	0.9	1.0	0.5	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 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 84639 MWH. THE UNIT WAS IN THE ROUTINE MAINTENANCE OUTAGE FROM 08.05.18 TO 08.05.21. 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

<b>Date of Construction Start:</b>	01 Feb 1975	<b>Lifetime Generation:</b>	160876.0 GW(e).h
<b>Date of First Criticality:</b>	29 Dec 1980	<b>Cumulative Energy Availability Factor:</b>	72.5%
<b>Date of Grid Connection:</b>	09 Feb 1981	<b>Cumulative Load Factor:</b>	71.5%
<b>Date of Commercial Operation:</b>	29 Aug 1981	<b>Cumulative Unit Capability Factor:</b>	73.8%
		<b>Cumulative Energy Unavailability Factor:</b>	27.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	2582.8	925.0	76.9	76.9	76.9	76.9	76.0	76.0	3169	86.3
1982	6715.2	925.0	83.7	81.7	83.6	81.6	82.9	80.8	7609	86.9
1983	6844.2	925.0	86.1	83.5	85.3	83.1	84.5	82.3	8159	93.1
1984	6126.3	925.0	74.9	81.0	74.4	80.6	75.4	80.3	6803	77.4
1985	7335.3	925.0	91.2	83.3	90.9	82.9	90.5	82.6	8309	94.9
1986	7060.9	925.0	88.7	84.3	87.6	83.8	87.1	83.5	7826	89.3
1987	7319.2	1000.0	85.0	84.4	84.1	83.9	83.6	83.5	7530	86.0
1988	6050.4	925.0	74.8	83.1	74.8	82.6	74.5	82.3	6667	75.9
1989	7409.7	925.0	91.9	84.2	91.5	83.7	91.4	83.3	8185	93.4
1990	7762.6	925.0	96.1	85.4	95.4	84.9	95.8	84.7	8588	98.0
1991	6130.7	925.0	76.8	84.6	76.1	84.1	75.7	83.8	6870	78.4
1992	5618.1	925.0	70.8	83.4	70.3	82.9	69.2	82.5	6617	75.3
1993	6735.7	925.0	87.6	83.7	85.3	83.1	83.1	82.6	7762	88.6
1994	6167.1	925.0	83.2	83.7	82.1	83.0	76.1	82.1	7340	83.8
1995	6141.0	925.0	86.1	83.9	83.0	83.0	75.8	81.7	7270	83.0
1996	7079.7	925.0	88.8	84.2	88.3	83.3	87.1	82.0	8048	91.6
1997	7644.7	925.0	98.2	85.0	95.9	84.1	94.3	82.8	8760	100.0
1998	3682.0	925.0	47.3	82.9	46.0	81.9	45.4	80.6	4341	49.6
1999	0.0	925.0	0.0	78.4	0.0	77.5	0.0	76.3	0	0.0
2000	0.0	925.0	0.0	74.4	0.0	73.5	0.0	72.4	0	0.0
2001	3585.7	925.0	45.5	73.0	44.6	72.1	44.3	71.0	4387	50.1
2002	7528.5	925.0	97.6	74.1	93.9	73.1	92.9	72.0	8760	100.0
2003	1957.2	925.0	26.0	72.0	24.7	71.0	24.2	69.9	2399	27.4
2004	7232.2	925.0	92.3	72.8	89.6	71.8	89.0	70.7	8243	93.8
2005	6730.1	925.0	89.3	73.5	83.8	72.3	83.0	71.2	7838	89.5
2006	5611.9	925.0	69.4	73.3	69.4	72.1	69.3	71.1	6197	70.7
2007	4827.4	925.0	64.8	73.0	59.7	71.7	59.6	70.7	5713	65.2
2008	7526.2	925.0	94.9	73.8	94.7	72.5	92.9	71.5	8714	99.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					46	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	70			1234		
D. Inspection, maintenance or repair without refuelling				300		
E. Testing of plant systems or component					0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				227		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				143	49	
J. Grid limitation, failure or grid unavailability					2	10
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					27	1
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					0	
Subtotal	70	0	0	1904	124	11
Total		70			2039	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		2
15. Reactor Cooling System		20
16. Steam generation system		2
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		5
41. Main Generator System		2
42. Electrical Power Supply System		9
Total	0	43

## RU-9 NOVOVORONEZH-3

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 1866.6 GW(e).h  
**Energy Availability Factor:** 57.1%  
**Load Factor:** 55.3%  
**Operating Factor:** 86.6%  
**Energy Unavailability Factor:** 42.9%  
**Total Off-line Time:** 1176 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	234.3	206.8	202.3	187.4	125.1	0.0	115.3	186.1	167.2	160.7	138.7	142.7	1866.6
<b>EAF (%)</b>	83.0	78.2	72.9	69.3	45.1	0.4	42.1	67.5	62.7	58.6	53.3	52.3	57.1
<b>UCF (%)</b>	83.0	78.2	73.6	69.3	45.1	0.4	44.9	72.7	64.0	59.6	53.9	52.3	58.0
<b>LF (%)</b>	81.8	79.9	70.6	67.7	43.7	0.0	40.2	65.0	60.3	56.0	50.0	49.8	55.3
<b>OF (%)</b>	100.0	103.6	99.9	100.1	77.7	0.0	57.8	100.0	100.0	100.0	100.0	100.0	86.6
<b>EUF (%)</b>	17.0	21.8	27.1	30.7	54.9	99.6	57.9	32.5	37.3	41.4	46.7	47.7	42.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	45.8	99.6	13.8	0.0	0.0	0.0	0.0	0.0	13.3
<b>UCLF (%)</b>	17.0	21.8	26.4	30.7	9.1	0.0	41.3	27.3	36.0	40.4	46.1	47.7	28.7
<b>XUF (%)</b>	0.0	0.0	0.7	0.0	0.0	0.0	2.8	5.1	1.3	1.1	0.6	0.0	1.0

UCLF replaces previously used UUF.

### 4. 2008 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 08.05.25 TO 08.07.04. 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:** 87502.0 GW(e).h  
**Cumulative Energy Availability Factor:** 71.0%  
**Cumulative Load Factor:** 70.2%  
**Cumulative Unit Capability Factor:** 71.7%  
**Cumulative Energy Unavailability Factor:** 29.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	1319.4	385.0	76.7	76.7	76.7	76.7	66.7	66.7	4397	85.6
1973	1877.2	385.0	57.9	64.8	57.9	64.8	55.7	59.7	7114	81.2
1974	2630.0	385.0	79.0	70.3	79.0	70.3	78.0	66.8	7990	91.2
1975	1967.9	385.0	58.0	66.9	58.0	66.9	58.4	64.4	6695	76.4
1976	2221.4	385.0	66.6	66.8	66.6	66.8	65.7	64.7	7534	85.8
1977	2786.3	385.0	82.1	69.6	82.1	69.6	82.6	67.9	7851	89.6
1978	2903.8	385.0	85.8	72.0	85.8	72.0	86.1	70.7	7962	90.9
1979	2632.9	385.0	77.9	72.8	77.9	72.8	78.1	71.7	7477	85.4
1980	2844.6	385.0	84.2	74.1	84.2	74.1	84.3	73.1	8246	94.1
1981	2827.2	385.0	84.0	75.1	84.0	75.1	83.8	74.2	7934	90.6
1982	2770.5	385.0	82.6	75.8	82.6	75.8	82.1	75.0	8037	91.7
1983	2470.0	385.0	74.1	75.7	74.1	75.7	73.2	74.8	7158	81.7
1984	3056.5	385.0	89.8	76.8	89.8	76.8	90.4	76.1	8185	93.2
1985	3003.8	385.0	88.9	77.7	88.9	77.7	89.1	77.0	8195	93.6
1986	2705.5	385.0	80.5	77.9	80.5	77.9	80.2	77.3	8048	91.9
1987	2321.9	417.0	66.5	77.1	66.5	77.1	63.6	76.3	6361	72.6
1988	2906.1	385.0	91.0	77.9	91.0	77.9	85.9	76.9	8110	92.3
1989	1984.6	385.0	66.0	77.3	66.0	77.3	58.8	75.9	6040	68.9
1990	2767.4	385.0	85.6	77.7	84.4	77.7	82.1	76.2	8611	98.3
1991	1614.0	385.0	49.2	76.3	48.7	76.2	47.9	74.8	5176	59.1
1992	2580.4	385.0	76.9	76.3	76.2	76.2	76.3	74.8	6991	79.6
1993	1810.5	385.0	53.8	75.3	53.0	75.1	53.7	73.9	4991	57.0
1994	2714.6	385.0	82.0	75.6	79.1	75.3	80.5	74.1	7300	83.3
1995	1364.0	385.0	41.3	74.1	40.6	73.8	40.4	72.7	3945	45.0
1996	1947.0	385.0	58.8	73.5	57.1	73.1	57.6	72.1	5510	62.7
1997	2624.0	385.0	79.7	73.7	77.4	73.3	77.8	72.3	7075	80.8
1998	2535.6	385.0	76.4	73.8	74.3	73.3	75.2	72.4	6822	77.9
1999	1919.3	385.0	61.4	73.4	57.1	72.8	56.9	71.9	5669	64.7
2000	2621.5	385.0	79.8	73.6	77.2	72.9	77.5	72.1	7131	81.2
2001	1293.4	385.0	38.5	72.4	38.2	71.7	38.3	70.9	3529	40.3
2002	2431.9	385.0	72.6	72.4	71.9	71.7	72.1	71.0	6415	73.2
2003	2335.0	385.0	69.6	72.3	68.9	71.7	69.2	70.9	6236	71.2
2004	2313.6	385.0	71.3	72.3	69.7	71.6	68.4	70.8	7282	82.9
2005	2472.1	385.0	75.7	72.4	74.2	71.7	73.3	70.9	7233	82.6
2006	2684.0	385.0	82.5	72.7	80.1	71.9	79.6	71.2	7621	87.0
2007	1713.5	385.0	52.4	72.1	52.3	71.4	50.8	70.6	6153	70.2
2008	1866.6	385.0	58.0	71.7	57.1	71.0	55.3	70.2	7584	86.6



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					156	
B. Refuelling without a maintenance outage					0	
C. Inspection, maintenance or repair combined with refuelling	960	240		1432		
D. Inspection, maintenance or repair without refuelling				140		
J. Grid limitation, failure or grid unavailability						1
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					5	
Z. Others					6	
Subtotal	960	240	0	1572	167	1
Total	1200			1740		

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		13
15. Reactor Cooling System:		1
16. Steam generation system:		100
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		10
35. All other I&C Systems:		0
42. Electrical Power Supply System:		1
Total	0	128

## RU-11 NOVOVORONEZH-4

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2876.3 GW(e).h  
**Energy Availability Factor:** 83.3%  
**Load Factor:** 85.3%  
**Operating Factor:** 85.2%  
**Energy Unavailability Factor:** 16.7%  
**Total Off-line Time:** 1296 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	300.8	246.5	233.9	281.1	288.5	276.6	274.2	269.9	203.6	0.0	197.3	303.8	2876.3
<b>EAF (%)</b>	100.0	87.2	78.0	100.0	99.6	99.5	96.3	94.6	73.6	0.4	71.6	100.0	83.3
<b>UCF (%)</b>	100.0	87.2	78.0	100.0	100.0	99.9	100.0	97.8	73.7	0.4	71.6	100.0	84.0
<b>LF (%)</b>	105.0	95.3	81.7	101.6	100.7	99.8	95.7	94.2	73.4	0.0	71.2	106.1	85.3
<b>OF (%)</b>	100.0	92.3	78.5	100.1	100.0	100.0	100.0	100.0	73.8	0.0	79.0	100.0	85.2
<b>EUF (%)</b>	0.0	12.8	22.0	0.0	0.4	0.5	3.7	5.4	26.4	99.6	28.4	0.0	16.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.4	99.6	23.4	0.0	12.6
<b>UCLF (%)</b>	0.0	12.8	22.0	0.0	0.0	0.1	0.0	2.2	0.0	0.0	5.0	0.0	3.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.4	0.4	3.7	3.2	0.1	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2008 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, NOVEMBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 64337 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.09.23 TO 08.11.06. 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:** 93752.0 GW(e).h  
**Cumulative Energy Availability Factor:** 77.5%  
**Cumulative Load Factor:** 77.1%  
**Cumulative Unit Capability Factor:** 79.0%  
**Cumulative Energy Unavailability Factor:** 22.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	2360.2	385.0	85.8	85.8	85.8	85.8	83.5	83.5	6838	93.1
1974	2411.8	385.0	71.3	77.9	71.3	77.9	71.5	77.0	7159	81.7
1975	2644.9	385.0	75.6	77.1	75.6	77.1	78.4	77.5	7950	90.8
1976	2924.1	385.0	84.5	79.0	84.5	79.0	86.5	79.8	7963	90.7
1977	2822.9	385.0	81.3	79.5	81.3	79.5	83.7	80.6	7637	87.2
1978	2658.5	385.0	78.2	79.3	78.2	79.3	78.8	80.3	7388	84.3
1979	2442.2	385.0	72.4	78.3	72.4	78.3	72.4	79.2	6888	78.6
1980	2842.9	385.0	84.1	79.0	84.1	79.0	84.1	79.8	7690	87.5
1981	3019.9	385.0	90.0	80.3	90.0	80.3	89.6	80.9	8278	94.5
1982	2797.5	385.0	83.9	80.6	83.9	80.6	82.9	81.1	8278	94.5
1983	2950.3	385.0	89.2	81.4	89.2	81.4	87.5	81.7	8216	93.8
1984	2974.1	385.0	87.9	82.0	87.9	82.0	87.9	82.2	7982	90.9
1985	3097.9	385.0	91.3	82.7	91.3	82.7	91.9	83.0	8250	94.2
1986	2792.2	385.0	82.6	82.7	82.6	82.7	82.8	83.0	7688	87.8
1987	3262.7	417.0	91.7	83.3	91.7	83.3	89.3	83.4	8252	94.2
1988	2529.4	385.0	80.0	83.1	80.0	83.1	74.8	82.9	7152	81.4
1989	2710.3	385.0	90.2	83.5	90.2	83.5	80.4	82.7	8357	95.4
1990	2244.7	385.0	70.5	82.8	69.6	82.8	66.6	81.8	6622	75.6
1991	1827.6	385.0	58.2	81.5	58.0	81.5	54.2	80.4	5540	63.2
1992	2853.4	385.0	87.3	81.8	82.4	81.5	84.4	80.6	8163	92.9
1993	2613.7	385.0	79.7	81.7	76.6	81.3	77.5	80.4	7204	82.2
1994	1954.3	385.0	66.9	81.0	56.6	80.1	57.9	79.4	6033	68.9
1995	2120.0	385.0	65.5	80.4	62.2	79.4	62.9	78.7	5818	66.4
1996	3080.3	385.0	93.8	80.9	90.4	79.8	91.1	79.2	8362	95.2
1997	2235.5	385.0	70.3	80.5	67.0	79.3	66.3	78.7	6690	76.4
1998	2714.9	385.0	83.2	80.6	80.2	79.3	80.5	78.7	7366	84.1
1999	1791.5	385.0	54.9	79.6	53.2	78.4	53.1	77.8	4927	56.2
2000	2474.3	385.0	74.6	79.5	73.1	78.2	73.2	77.6	6784	77.2
2001	2656.0	385.0	80.7	79.5	79.2	78.2	78.8	77.7	7173	81.9
2002	2184.8	385.0	65.4	79.0	64.2	77.8	64.8	77.2	5857	66.9
2003	2583.1	385.0	78.8	79.0	76.8	77.7	76.6	77.2	6950	79.3
2004	2714.0	385.0	83.7	79.2	80.8	77.8	80.3	77.3	7685	87.5
2005	2433.4	385.0	75.3	79.1	73.1	77.7	72.2	77.2	7228	82.5
2006	2575.1	385.0	81.3	79.1	76.5	77.6	76.4	77.1	7636	87.2
2007	2290.3	385.0	69.1	78.8	67.9	77.4	67.9	76.9	6488	74.1
2008	2876.3	385.0	84.0	79.0	83.3	77.5	85.3	77.1	7464	85.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1973 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		236			59	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1064			1077		
D. Inspection, maintenance or repair without refuelling				122		
E. Testing of plant systems or component				15		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				75		
J. Grid limitation, failure or grid unavailability						6
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				2	18	
L. Human factor related		21				
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					11	
Subtotal	1064	257	0	1291	90	6
Total		1321			1387	

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

System	2008 Hours Lost	1973 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		9
12. Reactor I&C Systems	76	14
15. Reactor Cooling System		1
16. Steam generation system	160	22
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		11
Total	236	57

## RU-20 NOVOVORONEZH-5

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power at the beginning of 2008:** 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 2008

**Net Energy Production:** 7285.2 GW(e).h  
**Energy Availability Factor:** 86.9%  
**Load Factor:** 87.5%  
**Operating Factor:** 88.1%  
**Energy Unavailability Factor:** 13.1%  
**Total Off-line Time:** 1042 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	707.8	651.4	709.7	688.3	701.2	680.5	306.5	61.8	659.5	700.6	695.4	722.3	7285.2
<b>EAF (%)</b>	100.0	97.8	99.6	99.8	99.8	99.4	44.0	10.2	96.0	98.4	99.8	100.0	86.9
<b>UCF (%)</b>	100.0	97.8	99.6	99.8	100.0	100.0	44.5	10.2	96.0	98.4	99.8	100.0	87.0
<b>LF (%)</b>	100.1	102.0	100.4	100.8	99.2	99.5	43.4	8.7	96.4	99.0	101.7	102.2	87.5
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	44.9	11.8	100.0	100.0	100.0	100.0	88.1
<b>EUf (%)</b>	0.0	2.2	0.4	0.2	0.2	0.6	56.0	89.8	4.0	1.6	0.2	0.0	13.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	55.5	88.9	4.0	0.0	0.0	0.0	12.6
<b>UCLF (%)</b>	0.0	2.2	0.4	0.2	0.0	0.0	0.0	0.9	0.0	1.6	0.2	0.0	0.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.2	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 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, AUGUST - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 50416 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.07.14 TO 08.08.28. 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

<b>Date of Construction Start:</b>	01 Mar 1974	<b>Lifetime Generation:</b>	140003.0 GW(e).h
<b>Date of First Criticality:</b>	30 Apr 1980	<b>Cumulative Energy Availability Factor:</b>	62.9%
<b>Date of Grid Connection:</b>	31 May 1980	<b>Cumulative Load Factor:</b>	62.6%
<b>Date of Commercial Operation:</b>	20 Feb 1981	<b>Cumulative Unit Capability Factor:</b>	63.8%
		<b>Cumulative Energy Unavailability Factor:</b>	37.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	4254.5	950.0	56.4	56.4	56.4	56.4	55.9	55.9	6213	77.5
1982	5042.8	950.0	60.9	58.7	60.9	58.7	60.6	58.3	6631	75.7
1983	6607.5	950.0	79.5	65.9	79.5	65.9	79.4	65.6	7716	88.1
1984	6979.6	950.0	83.4	70.4	83.4	70.4	83.6	70.2	7742	88.1
1985	6894.3	950.0	83.1	73.0	83.1	73.0	82.8	72.8	7979	91.1
1986	5523.8	950.0	66.0	71.8	65.9	71.8	66.4	71.7	6806	77.7
1987	7052.7	1000.0	81.8	73.3	81.8	73.3	80.5	73.0	7399	84.5
1988	3017.8	950.0	36.5	68.7	36.5	68.7	36.2	68.4	3439	39.2
1989	3308.9	950.0	40.9	65.6	40.9	65.6	39.8	65.2	3778	43.1
1990	3913.3	950.0	47.7	63.8	47.6	63.8	47.0	63.4	4715	53.8
1991	5878.2	950.0	71.5	64.5	71.5	64.5	70.6	64.0	6996	79.9
1992	3752.8	950.0	45.9	62.9	45.7	62.9	45.0	62.4	5244	59.7
1993	5935.4	950.0	73.8	63.8	72.6	63.6	71.3	63.1	7448	85.0
1994	2281.9	950.0	33.2	61.6	28.9	61.2	27.4	60.6	4288	48.9
1995	4753.7	950.0	63.9	61.7	57.5	60.9	57.1	60.3	6670	76.1
1996	3861.8	950.0	46.7	60.8	46.7	60.0	46.3	59.5	4759	54.2
1997	5949.3	950.0	71.7	61.4	71.4	60.7	71.5	60.2	6854	78.2
1998	3771.8	950.0	45.5	60.5	44.9	59.8	45.3	59.3	4457	50.9
1999	4845.4	950.0	61.2	60.6	58.7	59.8	58.2	59.3	6062	69.2
2000	5278.6	950.0	65.6	60.8	63.5	59.9	63.3	59.5	6479	73.8
2001	5984.6	950.0	73.2	61.4	72.3	60.5	71.9	60.1	7508	85.7
2002	6762.2	950.0	83.1	62.4	80.7	61.4	81.3	61.0	7430	84.8
2003	6951.2	950.0	84.5	63.4	83.1	62.4	83.5	62.0	7507	85.7
2004	3610.6	950.0	43.6	62.5	43.1	61.6	43.3	61.2	4032	45.9
2005	2544.3	950.0	31.4	61.3	30.6	60.3	30.6	60.0	2861	32.7
2006	7264.4	950.0	87.8	62.3	86.7	61.4	87.3	61.1	7762	88.6
2007	6556.3	950.0	79.8	63.0	78.5	62.0	78.8	61.7	7140	81.5
2008	7285.2	950.0	87.0	63.8	86.9	62.9	87.5	62.6	7718	88.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					830	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1066			1209		
D. Inspection, maintenance or repair without refuelling				551		
Subtotal	1066	0	0	1760	831	0
Total	1066			2591		

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		344
12. Reactor I&C Systems		26
13. Reactor Auxiliary System:		8
14. Safety Systems		3
15. Reactor Cooling System:		58
16. Steam generation system:		278
31. Turbine and auxiliaries		5
32. Feedwater and Main Steam System		19
35. All other I&C Systems		3
41. Main Generator System:		70
42. Electrical Power Supply System:		4
XX. Miscellaneous Systems		8
Total	0	826

## RU-23 SMOLENSK-1

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7794.9 GW(e).h  
**Energy Availability Factor:** 94.9%  
**Load Factor:** 96.2%  
**Operating Factor:** 96.2%  
**Energy Unavailability Factor:** 5.1%  
**Total Off-line Time:** 330 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	698.5	654.7	696.0	533.5	437.5	665.4	680.3	680.2	676.9	703.8	678.6	689.5	7794.9
<b>EAF (%)</b>	100.0	100.0	100.0	79.1	63.6	99.8	98.6	98.7	99.9	100.0	100.0	99.9	94.9
<b>UCF (%)</b>	100.0	100.0	100.0	79.1	63.6	100.0	100.0	100.0	100.0	100.0	100.0	99.9	95.2
<b>LF (%)</b>	101.5	105.3	101.1	80.2	63.6	99.9	98.8	98.8	101.6	102.1	101.9	100.2	96.2
<b>OF (%)</b>	100.0	103.6	99.9	80.3	71.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.2
<b>EUF (%)</b>	0.0	0.0	0.0	20.9	36.4	0.2	1.4	1.3	0.1	0.0	0.0	0.1	5.1
<b>PUF (%)</b>	0.0	0.0	0.0	20.9	36.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8
<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	0.1	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.2	1.4	1.3	0.1	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2008 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 70902 MWH. THE UNIT WAS IN THE ROUTINE MAINTENANCE OUTAGE FROM 08.04.25 TO 08.05.13. 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

<b>Date of Construction Start:</b>	01 Oct 1975	<b>Lifetime Generation:</b>	149873.0 GW(e).h
<b>Date of First Criticality:</b>	10 Sep 1982	<b>Cumulative Energy Availability Factor:</b>	72.1%
<b>Date of Grid Connection:</b>	09 Dec 1982	<b>Cumulative Load Factor:</b>	71.7%
<b>Date of Commercial Operation:</b>	30 Sep 1983	<b>Cumulative Unit Capability Factor:</b>	74.6%
		<b>Cumulative Energy Unavailability Factor:</b>	27.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	2275.4	925.0	99.7	99.7	99.7	99.7	84.0	84.0	2547	87.0
1984	6921.4	925.0	84.2	88.1	84.2	88.1	85.2	84.9	7830	89.1
1985	5850.2	925.0	74.9	82.4	72.4	81.4	72.2	79.5	6806	77.7
1986	3039.8	925.0	37.8	69.1	37.8	68.3	37.5	66.9	3472	39.6
1987	7445.8	1000.0	86.7	73.4	86.7	72.8	85.0	71.3	7620	87.0
1988	6695.6	925.0	81.9	75.0	81.9	74.5	82.4	73.4	7288	83.0
1989	6506.5	925.0	79.7	75.7	79.3	75.3	80.3	74.4	7177	81.9
1990	6227.8	925.0	76.6	75.8	76.1	75.4	76.9	74.8	6851	78.2
1991	6693.9	925.0	81.3	76.5	81.3	76.1	82.6	75.7	7252	82.8
1992	6849.4	925.0	83.7	77.2	83.7	76.9	84.3	76.6	7563	86.1
1993	6290.6	925.0	78.4	77.3	78.0	77.0	77.6	76.7	6993	79.8
1994	4217.8	925.0	71.0	76.8	57.8	75.3	52.1	74.6	6286	71.8
1995	5002.5	925.0	77.3	76.8	63.0	74.3	61.7	73.5	6390	72.9
1996	5666.4	925.0	71.7	76.5	71.6	74.1	69.7	73.2	6604	75.2
1997	4674.5	925.0	59.1	75.3	57.8	73.0	57.7	72.2	5366	61.3
1998	3554.1	925.0	58.8	74.2	45.0	71.2	43.9	70.3	5411	61.8
1999	6478.9	925.0	83.5	74.8	80.1	71.7	80.0	70.9	7417	84.7
2000	5228.5	925.0	64.4	74.2	63.8	71.3	64.3	70.5	5738	65.3
2001	5165.1	925.0	67.4	73.8	63.2	70.8	63.7	70.2	5940	67.8
2002	6866.7	925.0	85.1	74.4	83.7	71.5	84.7	70.9	7587	86.6
2003	6711.8	925.0	84.4	74.9	82.9	72.0	82.8	71.5	7533	86.0
2004	2337.1	925.0	29.1	72.7	28.5	70.0	28.8	69.5	2592	29.5
2005	7354.1	925.0	94.7	73.7	90.6	70.9	90.7	70.4	8414	96.0
2006	5417.1	925.0	67.1	73.4	67.1	70.8	66.9	70.3	6021	68.7
2007	6569.7	925.0	80.8	73.7	80.3	71.2	81.1	70.7	7138	81.5
2008	7794.9	925.0	95.2	74.6	94.9	72.1	96.2	71.7	8430	96.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					72	
B. Refuelling without a maintenance outage					0	
C. Inspection, maintenance or repair combined with refuelling	354			979		
D. Inspection, maintenance or repair without refuelling				423		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				408		17
J. Grid limitation, failure or grid unavailability						6
Subtotal	354	0	0	1810	72	23
Total		354			1905	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		17
12. Reactor I&C Systems		16
13. Reactor Auxiliary System:		12
14. Safety Systems		9
15. Reactor Cooling System:		0
17. Safety I&C Systems (excluding reactor I&C)		2
32. Feedwater and Main Steam System		11
42. Electrical Power Supply System:		0
Total	0	67



## RU-24 SMOLENSK-2

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6718.8 GW(e).h  
**Energy Availability Factor:** 83.2%  
**Load Factor:** 82.9%  
**Operating Factor:** 89.3%  
**Energy Unavailability Factor:** 16.8%  
**Total Off-line Time:** 937 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	543.8	74.9	166.0	465.0	698.6	658.7	674.7	674.6	675.1	708.7	681.8	696.7	6718.8
<b>EAF (%)</b>	90.4	9.8	26.3	71.0	100.0	98.9	97.8	97.9	99.9	100.0	100.0	100.0	83.2
<b>UCF (%)</b>	90.4	9.8	26.3	71.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.6
<b>LF (%)</b>	79.0	12.1	24.1	69.9	101.5	98.9	98.0	98.0	101.4	102.8	102.4	101.2	82.9
<b>OF (%)</b>	100.0	25.0	52.7	88.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.3
<b>EUF (%)</b>	9.6	90.2	73.7	29.0	0.0	1.1	2.2	2.1	0.1	0.0	0.0	0.0	16.8
<b>PUF (%)</b>	8.6	90.2	73.7	12.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.9
<b>UCLF (%)</b>	1.0	0.0	0.0	16.7	0.0	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	1.1	2.2	2.1	0.1	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2008 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, SEPTEMBER - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 66989 MWH. THE UNIT WAS IN THE ROUTINE MAINTENANCE OUTAGE FROM 08.02.08 TO 08.03.15. 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

<b>Date of Construction Start:</b>	01 Jun 1976	<b>Lifetime Generation:</b>	139870.0 GW(e).h
<b>Date of First Criticality:</b>	09 Apr 1985	<b>Cumulative Energy Availability Factor:</b>	73.2%
<b>Date of Grid Connection:</b>	31 May 1985	<b>Cumulative Load Factor:</b>	73.1%
<b>Date of Commercial Operation:</b>	02 Jul 1985	<b>Cumulative Unit Capability Factor:</b>	76.0%
		<b>Cumulative Energy Unavailability Factor:</b>	26.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	3308.1	925.0	90.6	90.6	81.3	81.3	81.0	81.0	4059	91.9
1986	6667.3	925.0	82.6	85.3	82.6	82.2	82.3	81.8	7442	85.0
1987	6364.9	1000.0	74.5	80.8	74.5	79.0	72.7	78.0	6707	76.6
1988	6757.2	925.0	83.6	81.5	83.5	80.2	83.2	79.4	7594	86.5
1989	6627.3	925.0	81.9	81.6	81.5	80.5	81.8	80.0	7336	83.7
1990	6710.6	925.0	83.0	81.9	82.5	80.9	82.8	80.5	7453	85.1
1991	5796.7	925.0	71.4	80.3	71.4	79.4	71.5	79.1	6495	74.1
1992	6731.6	925.0	83.9	80.7	82.6	79.8	82.9	79.6	7472	85.1
1993	6634.1	925.0	84.9	81.2	82.7	80.2	81.9	79.9	7492	85.5
1994	5259.8	925.0	80.2	81.1	66.6	78.8	64.9	78.3	7044	80.4
1995	5337.4	925.0	80.3	81.1	66.8	77.6	65.9	77.1	6738	76.9
1996	6127.7	925.0	79.1	80.9	77.8	77.6	75.4	77.0	7010	79.8
1997	4991.0	925.0	61.7	79.4	61.6	76.4	61.6	75.8	5642	64.4
1998	5297.0	925.0	73.9	79.0	65.6	75.6	65.4	75.0	6576	75.1
1999	5362.5	925.0	69.1	78.3	66.0	74.9	66.2	74.4	6090	69.5
2000	6566.1	925.0	80.5	78.4	80.1	75.3	80.8	74.8	7108	80.9
2001	6457.6	925.0	81.0	78.6	79.0	75.5	79.7	75.1	7537	86.0
2002	3431.1	925.0	43.6	76.6	41.7	73.6	42.3	73.2	3890	44.4
2003	6438.6	925.0	81.4	76.9	79.1	73.9	79.5	73.6	7734	88.3
2004	7480.1	925.0	93.7	77.7	90.9	74.7	92.1	74.5	8312	94.6
2005	3053.4	925.0	41.7	76.0	37.7	72.9	37.7	72.7	3734	42.6
2006	7623.9	925.0	93.1	76.8	93.1	73.9	94.1	73.7	8306	94.8
2007	4096.4	925.0	50.8	75.6	49.7	72.8	50.6	72.7	4878	55.7
2008	6718.8	925.0	83.6	76.0	83.2	73.2	82.9	73.1	7823	89.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		82			60	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	879			801		
D. Inspection, maintenance or repair without refuelling				400		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				200		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				367		15
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					2	
Subtotal	879	82	0	1768	65	17
Total		961			1850	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	82	
12. Reactor I&C Systems		11
15. Reactor Cooling System		20
16. Steam generation system		2
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		4
42. Electrical Power Supply System		15
Total	82	54

## RU-67 SMOLENSK-3

**Operator:** EA (JSC "Concern Energoatom")

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

### 1. Station Details

**Type:** LWGR  
**Net Reference Unit Power at the beginning of 2008:** 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 2008

**Net Energy Production:** 5093.4 GW(e).h  
**Energy Availability Factor:** 61.1%  
**Load Factor:** 62.9%  
**Operating Factor:** 61.6%  
**Energy Unavailability Factor:** 38.9%  
**Total Off-line Time:** 3364 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	718.7	670.3	714.5	692.2	703.6	670.6	683.3	240.3	0.0	0.0	0.0	0.0	5093.4
<b>EAF (%)</b>	100.0	100.0	99.8	100.0	99.7	100.0	99.4	37.1	0.0	0.0	0.0	0.0	61.1
<b>UCF (%)</b>	100.0	100.0	99.8	100.0	99.7	100.0	100.0	37.2	0.0	0.0	0.0	0.0	61.2
<b>LF (%)</b>	104.4	107.8	103.8	104.1	102.2	100.7	99.3	34.9	0.0	0.0	0.0	0.0	62.9
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	38.3	0.0	0.0	0.0	0.0	61.6
<b>EUAF (%)</b>	0.0	0.0	0.2	0.0	0.3	0.0	0.6	62.9	100.0	100.0	100.0	100.0	38.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.8	100.0	100.0	100.0	100.0	38.8
<b>UCLF (%)</b>	0.0	0.0	0.2	0.0	0.3	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	0.6	0.1	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - AUGUST. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 140926 MWH. THE UNIT WAS IN THE OVERHAUL OUTAGE FROM 08.08.12 TO 08.12.31 INVOLVING PARTIAL FUEL CHANNEL REPLACEMENT. 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      **Lifetime Generation:** 118699.0 GW(e).h  
**Date of First Criticality:** 29 Dec 1989      **Cumulative Energy Availability Factor:** 78.2%  
**Date of Grid Connection:** 17 Jan 1990      **Cumulative Load Factor:** 78.3%  
**Date of Commercial Operation:** 12 Oct 1990      **Cumulative Unit Capability Factor:** 80.9%  
**Cumulative Energy Unavailability Factor:** 21.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1990	2066.9	925.0	99.1	99.1	99.1	99.1	101.2	101.2	2208	100.0
1991	6561.7	925.0	80.9	84.5	80.9	84.5	81.0	85.0	7338	83.8
1992	6866.6	925.0	83.9	84.3	83.9	84.3	84.5	84.8	7515	85.6
1993	6596.0	925.0	82.6	83.8	81.4	83.4	81.4	83.8	7419	84.7
1994	5513.7	925.0	82.3	83.4	72.5	80.8	68.0	80.1	6701	76.5
1995	5091.0	925.0	78.2	82.4	63.2	77.5	62.8	76.8	5844	66.7
1996	6496.6	925.0	82.2	82.4	80.8	78.0	80.0	77.3	7268	82.7
1997	5559.3	925.0	69.3	80.6	69.3	76.8	68.6	76.1	6469	73.8
1998	4575.9	925.0	68.9	79.2	57.5	74.5	56.5	73.7	6162	70.3
1999	6411.0	925.0	79.3	79.2	78.2	74.9	79.1	74.3	7063	80.6
2000	6970.5	925.0	84.7	79.7	84.6	75.8	85.8	75.4	7542	85.9
2001	6951.7	925.0	87.3	80.4	85.4	76.7	85.8	76.3	7823	89.3
2002	7204.9	925.0	88.7	81.1	87.7	77.6	88.9	77.4	7831	89.4
2003	7038.2	925.0	87.1	81.5	86.3	78.2	86.9	78.1	7697	87.9
2004	7085.7	925.0	87.9	82.0	86.9	78.8	87.2	78.7	7765	88.4
2005	7303.7	925.0	93.1	82.7	90.4	79.6	90.1	79.5	8192	93.5
2006	4943.0	925.0	60.7	81.3	60.7	78.4	61.0	78.3	5631	64.3
2007	7566.3	925.0	93.2	82.0	92.5	79.2	93.4	79.2	8247	94.1
2008	5093.4	925.0	61.2	80.9	61.1	78.2	62.9	78.3	5396	61.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1990 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					60	
C. Inspection, maintenance or repair combined with refuelling				722		
D. Inspection, maintenance or repair without refuelling				415		
F. Major back-fitting, refurbishment or upgrading activities with refuelling	3388					
G. Major back-fitting, refurbishment or upgrading activities without refuelling				164		84
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					28	
Subtotal	3388	0	0	1301	88	84
Total	3388			1473		

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

System	2008 Hours Lost	1990 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		5
21. Fuel Handling and Storage Facilities		19
35. All other I&C Systems		5
41. Main Generator Systems		2
42. Electrical Power Supply Systems		9
99. No System Code		7
Total	0	56

# RU-59 VOLGODONSK-1

**Operator:** EA (JSC "Concern Energoatom")

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

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7745.7 GW(e).h  
**Energy Availability Factor:** 88.5%  
**Load Factor:** 93.1%  
**Operating Factor:** 89.0%  
**Energy Unavailability Factor:** 11.5%  
**Total Off-line Time:** 961 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	742.8	699.0	746.9	421.3	96.5	706.0	733.9	737.6	722.6	749.5	724.5	665.0	7745.7
<b>EAF (%)</b>	99.9	100.0	99.9	59.8	15.2	98.8	100.0	100.0	100.0	100.0	100.0	89.6	88.5
<b>UCF (%)</b>	99.9	100.0	99.9	60.2	15.2	98.8	100.0	100.0	100.0	100.0	100.0	89.6	88.5
<b>LF (%)</b>	105.1	109.5	105.7	61.7	13.7	103.2	103.8	104.4	105.6	105.9	105.9	94.1	93.1
<b>OF (%)</b>	100.0	103.6	99.9	60.5	15.7	100.0	100.0	100.0	100.0	100.0	100.0	90.2	89.0
<b>EUF (%)</b>	0.1	0.0	0.1	40.2	84.8	1.2	0.0	0.0	0.0	0.0	0.0	10.4	11.5
<b>PUF (%)</b>	0.0	0.0	0.0	39.8	84.8	1.2	0.0	0.0	0.0	0.0	0.0	0.0	10.6
<b>UCLF (%)</b>	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	0.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

THE RUSSIAN NPPS ARE OPERATING IN THE BASELOAD MODE AGREED WITH THE RUSSIA'S FEDERAL ENERGY COMMISSION. UNIT OPERATION AT POWER LEVEL ABOVE INSTALLED CAPACITY TOOK PLACE IN JANUARY - DECEMBER. ADDITIONAL ELECTRICITY GENERATION AMOUNTED TO 326871 MWH. THE UNIT WAS IN THE INTERMEDIATE MAINTENANCE OUTAGE FROM 08.04.19 TO 08.05.27. 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 Sep 1981 **Lifetime Generation:** 55065.0 GW(e).h  
**Date of First Criticality:** 23 Feb 2001 **Cumulative Energy Availability Factor:** 85.2%  
**Date of Grid Connection:** 30 Mar 2001 **Cumulative Load Factor:** 87.7%  
**Date of Commercial Operation:** 25 Dec 2001 **Cumulative Unit Capability Factor:** 85.9%  
**Cumulative Energy Unavailability Factor:** 14.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2001			Data not provided							
2002	7176.2	950.0	85.5	85.5	84.1	84.1	86.2	86.2	7543	86.1
2003	6973.9	950.0	82.6	84.0	81.3	82.7	83.8	85.0	7154	81.7
2004	7439.3	950.0	88.0	85.3	87.8	84.4	89.1	86.4	7766	88.4
2005	7232.9	950.0	86.9	85.7	85.9	84.8	86.9	86.5	7628	87.1
2006	7216.4	950.0	84.2	85.4	83.8	84.6	86.7	86.6	7386	84.3
2007	7309.4	950.0	85.5	85.4	85.3	84.7	87.8	86.8	7536	86.0
2008	7745.7	950.0	88.5	85.9	88.5	85.2	93.1	87.7	7799	89.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2002 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		73			91	
C. Inspection, maintenance or repair combined with refuelling	912			974		
L. Human factor related					1	
Subtotal	912	73	0	974	92	0
Total		985			1066	

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

System	2008 Hours Lost	2002 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	73	
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		2
33. Circulating Water System		5
41. Main Generator Systems		73
42. Electrical Power Supply Systems		4
Total	73	88

## SK-3 BOHUNICE-2

**Operator:** JAVYS (JADROVA A VYRADOVACIA SPOLOCNOST)

**Contractor:** AEE (ATOMENERGOEXPORT)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 408.0 MW(e)  
**Design Net Capacity:** 408.0 MW(e)  
**Design Discharge Burnup:** 35000 MW.d/t  
**Status at end of year:** Permanent Shutdown

### 2. Production Summary 2008

**Net Energy Production:** 3276.1 GW(e).h  
**Energy Availability Factor:** 95.6%  
**Load Factor:** 91.7%  
**Operating Factor:** 100.2%  
**Energy Unavailability Factor:** 4.4%  
**Total Off-line Time:** -20 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	285.8	270.7	286.2	284.5	284.4	267.0	279.3	280.9	273.6	288.7	277.3	197.7	3276.1
<b>EAF (%)</b>	100.0	100.0	99.0	99.7	98.1	94.8	96.4	96.9	96.8	99.2	97.4	69.6	95.6
<b>UCF (%)</b>	100.0	100.0	99.0	100.0	100.0	98.1	100.0	100.0	98.5	100.0	100.0	100.0	99.6
<b>LF (%)</b>	94.1	98.7	94.3	97.0	93.7	90.9	92.0	92.5	93.1	95.0	94.4	65.1	91.7
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	100.2
<b>EUF (%)</b>	0.0	0.0	1.0	0.3	1.9	5.2	3.6	3.1	3.2	0.8	2.6	30.4	4.4
<b>PUF (%)</b>	0.0	0.0	1.0	0.0	0.0	1.9	0.0	0.0	1.5	0.0	0.0	0.0	0.4
<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	0.3	1.9	3.3	3.6	3.1	1.7	0.8	2.6	30.4	4.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

BOHUNICE-2 UNIT PROVIDED SUPPORT SERVICES (ANCILLARY SERVICES) - PRIMARY FREQUENCY CONTROL AND TERTIARY ACTIVE POWER CONTROL. 31.12.2008 BOHUNICE 2 NPP WAS PERMANENTLY SHUTDOWN DUE TO DECISION OF SLOVAKIA GOVERNMENT. BOHUNICE-1 UNIT WAS SIMILARLY SHUT DOWN AT THE END OF 2006. THE TWO UNITS AT THE PLANT, WHICH IS ALSO KNOWN AS BOHUNICE NPP V1, HAD PRODUCED A COMBINED TOTAL OF 159 TERAWATT HOURS OF ELECTRICITY.

## 5. Historical Summary

<b>Date of Construction Start:</b>	24 Apr 1972	<b>Lifetime Generation:</b>	76957.7 GW(e).h
<b>Date of First Criticality:</b>	15 Mar 1980	<b>Cumulative Energy Availability Factor:</b>	75.9%
<b>Date of Grid Connection:</b>	26 Mar 1980	<b>Cumulative Load Factor:</b>	75.0%
<b>Date of Commercial Operation:</b>	01 Jan 1981	<b>Cumulative Unit Capability Factor:</b>	78.1%
<b>Date of Shutdown:</b>	31 Dec 2008	<b>Cumulative Energy Unavailability Factor:</b>	24.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	2524.9	382.0	72.9	72.9	72.9	72.9	75.5	75.5	7325	83.6
1982	2657.3	398.0	77.4	75.2	77.4	75.2	76.2	75.8	6878	78.5
1983	2946.6	398.0	84.8	78.4	84.8	78.4	84.5	78.8	7610	86.9
1984	2782.6	408.0	76.2	77.9	76.2	77.9	77.6	78.5	7304	83.2
1985	2444.7	408.0	72.6	76.8	72.3	76.7	68.4	76.4	6656	76.0
1986	2833.0	408.0	80.3	77.4	80.3	77.3	79.3	76.9	7482	85.4
1987	2902.4	408.0	86.8	78.7	82.9	78.1	81.2	77.5	7833	89.4
1988	2947.5	408.0	84.2	79.4	84.0	78.9	82.2	78.1	7757	88.3
1989	2637.8	408.0	73.8	78.8	73.6	78.3	73.8	77.6	6831	78.0
1990	2683.0	408.0	76.7	78.6	76.1	78.1	75.1	77.4	6939	79.2
1991	2583.5	408.0	72.6	78.0	72.1	77.5	72.3	76.9	6673	76.2
1992	2704.5	408.0	73.8	77.7	70.3	76.9	75.5	76.8	6774	77.1
1993	2057.4	408.0	59.3	76.2	57.6	75.4	57.6	75.3	5433	62.0
1994	2761.8	405.0	80.8	76.6	77.7	75.6	77.8	75.5	7371	84.1
1995	2989.5	408.0	83.7	77.0	79.8	75.9	83.6	76.0	6929	79.1
1996	2712.6	436.0	74.7	76.9	72.3	75.6	70.8	75.7	6705	76.3
1997	2321.0	408.0	62.8	76.1	60.4	74.7	64.9	75.0	5698	65.0
1998	1839.2	408.0	53.9	74.8	52.3	73.5	51.5	73.7	4886	55.8
1999	2278.3	408.0	68.0	74.5	63.9	73.0	63.7	73.2	6125	69.9
2000	2527.5	408.0	76.3	74.6	71.1	72.9	70.5	73.1	6715	76.4
2001	2899.3	408.0	88.3	75.2	81.8	73.3	81.1	73.5	7793	89.0
2002	2855.1	408.0	87.7	75.8	84.2	73.8	79.9	73.7	7713	88.0
2003	2614.9	408.0	80.0	76.0	76.6	73.9	73.2	73.7	7081	80.8
2004	2861.8	408.0	88.0	76.5	84.5	74.4	79.9	74.0	7977	90.8
2005	2821.6	408.0	85.2	76.8	82.7	74.7	78.9	74.2	7482	85.4
2006	2706.9	408.0	83.7	77.1	81.4	75.0	75.7	74.2	8037	91.7
2007	2743.4	408.0	83.7	77.3	81.0	75.2	76.8	74.3	7407	84.6
2008	3276.1	408.0	99.6	78.1	95.6	75.9	91.7	75.0	8780	100.2



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					62	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1267					
D. Inspection, maintenance or repair without refuelling	281					
E. Testing of plant systems or component:	3					
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	
Subtotal	0	0	0	1551	63	1
Total	0			1615		

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		1
13. Reactor Auxiliary System:		14
14. Safety Systems		0
15. Reactor Cooling System:		1
16. Steam generation system:		4
17. Safety I&C Systems (excluding reactor I&C)		12
31. Turbine and auxiliaries:		1
32. Feedwater and Main Steam System		4
35. All other I&C Systems:		1
42. Electrical Power Supply System:		7
Total	0	56

# 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  
 at the beginning of 2008: 408.0 MW(e)  
 Design Net Capacity: 420.0 MW(e)  
 Design Discharge Burnup: 35000 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 3038.4 GW(e).h  
 Energy Availability Factor: 85.8%  
 Load Factor: 83.7%  
 Operating Factor: 87.4%  
 Energy Unavailability Factor: 14.2%  
 Total Off-line Time: 1104 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	291.2	273.5	298.1	285.3	292.6	282.8	291.5	72.7	37.9	303.3	298.2	311.3	3038.4
EAF (%)	99.4	99.1	99.8	99.0	97.7	97.7	97.2	24.7	14.3	99.4	99.4	100.0	85.8
UCF (%)	99.7	99.5	100.0	100.0	99.9	100.0	100.0	25.8	14.4	99.5	99.5	100.0	86.7
LF (%)	95.9	96.3	98.2	97.1	96.4	96.3	96.0	23.9	12.9	95.0	96.6	97.5	83.7
OF (%)	100.0	100.0	99.9	100.0	100.0	100.0	100.0	26.3	24.2	98.8	100.0	100.0	87.4
EU (%)	0.6	0.9	0.2	1.0	2.3	2.3	2.8	75.3	85.7	0.6	0.6	0.0	14.2
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.2	80.5	0.5	0.5	0.0	12.8
UCLF (%)	0.3	0.6	0.0	0.0	0.1	0.0	0.0	0.0	5.1	0.0	0.0	0.0	0.5
XUF (%)	0.3	0.4	0.2	1.0	2.2	2.3	2.8	1.1	0.1	0.1	0.1	0.0	0.9

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

REFERENCE UNIT POWER (NET) WAS INCREASED AFTER ANNUAL MAINTENANCE AND REFUELLING FROM 408 MW TO 429 MW (FROM 1.10.2008). INCONSISTENCIES IN ENERGY GENERATED ACCORDING TO ENERGY LOSSES TABLE ARE CAUSED BY ANCILLARY SERVICES.

## 5. Historical Summary

Date of Construction Start: 01 Dec 1976      Lifetime Generation: 66100.4 GW(e).h  
 Date of First Criticality: 07 Aug 1984      Cumulative Energy Availability Factor: 77.6%  
 Date of Grid Connection: 20 Aug 1984      Cumulative Load Factor: 75.7%  
 Date of Commercial Operation: 14 Feb 1985      Cumulative Unit Capability Factor: 80.8%  
    Cumulative Energy Unavailability Factor: 22.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	2435.0	408.0	76.8	76.8	76.8	76.8	74.5	74.5	6322	78.9
1986	2674.1	408.0	75.4	76.1	75.4	76.1	74.8	74.6	7089	80.9
1987	1997.4	408.0	55.5	69.0	53.7	68.4	55.9	68.2	5181	59.1
1988	2866.9	408.0	80.2	71.9	79.9	71.3	80.0	71.2	7329	83.4
1989	2992.3	408.0	85.0	74.6	84.1	73.9	83.7	73.8	7633	87.1
1990	2829.1	408.0	80.5	75.6	79.2	74.8	79.2	74.7	7376	84.2
1991	2585.6	408.0	74.2	75.4	71.9	74.4	72.3	74.3	6717	76.7
1992	3140.7	408.0	83.9	76.4	82.8	75.5	87.6	76.0	7528	85.7
1993	2973.1	408.0	86.5	77.6	83.2	76.3	83.2	76.8	7721	88.1
1994	2806.8	405.0	84.0	78.2	79.1	76.6	79.1	77.1	7423	84.7
1995	2536.7	408.0	78.1	78.2	70.1	76.0	71.0	76.5	6440	73.5
1996	3045.9	436.0	85.6	78.9	82.5	76.6	79.5	76.8	7504	85.4
1997	3096.4	440.0	87.7	79.6	84.0	77.2	80.3	77.1	7711	88.0
1998	2804.6	408.0	85.3	80.0	81.8	77.5	78.5	77.2	7571	86.4
1999	2468.5	408.0	76.5	79.8	69.7	77.0	69.1	76.6	6620	75.6
2000	2806.7	408.0	87.9	80.3	79.8	77.2	78.3	76.7	7776	88.5
2001	2687.0	408.0	86.6	80.7	76.5	77.1	75.2	76.6	7680	87.7
2002	2690.7	408.0	87.4	81.0	83.9	77.5	75.3	76.6	7711	88.0
2003	2485.0	408.0	78.3	80.9	75.5	77.4	69.5	76.2	6908	78.9
2004	2564.5	408.0	82.0	80.9	79.0	77.5	71.6	76.0	7228	82.3
2005	2587.7	408.0	79.4	80.9	76.7	77.5	72.4	75.8	7034	80.3
2006	2582.6	408.0	80.7	80.9	78.4	77.5	72.3	75.6	7106	81.1
2007	2432.6	408.0	73.8	80.6	71.6	77.2	68.1	75.3	6687	76.3
2008	3038.4	429.0	86.7	80.8	85.8	77.6	83.7	75.7	7680	87.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		18			81	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1076			1272		
D. Inspection, maintenance or repair without refuelling				136		
J. Grid limitation, failure or grid unavailability			10			7
Subtotal	1076	18	10	1408	81	7
Total		1104			1496	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary Systems		5
14. Safety Systems		1
15. Reactor Cooling System		15
16. Steam generation system		35
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	3	
32. Feedwater and Main Steam System		10
33. Circulating Water System		1
41. Main Generator System	15	0
42. Electrical Power Supply System		6
Total	18	77

# 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  
 at the beginning of 2008: 408.0 MW(e)  
 Design Net Capacity: 408.0 MW(e)  
 Design Discharge Burnup: 35000 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 2739.0 GW(e).h  
 Energy Availability Factor: 78.8%  
 Load Factor: 76.5%  
 Operating Factor: 82.8%  
 Energy Unavailability Factor: 21.2%  
 Total Off-line Time: 1506 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	281.7	268.4	278.9	278.8	274.1	0.0	0.0	268.8	277.5	223.2	290.6	297.0	2739.0
EAF (%)	98.9	99.1	99.5	97.7	91.1	0.0	0.0	89.6	97.1	73.2	100.0	100.0	78.8
UCF (%)	100.0	100.0	100.0	99.0	93.6	0.0	0.0	92.1	98.1	73.4	100.0	100.0	79.6
LF (%)	92.8	97.9	91.9	95.0	90.3	0.0	0.0	88.1	94.0	73.1	98.4	97.4	76.5
OF (%)	100.0	103.6	99.9	100.1	94.1	0.0	0.0	97.8	99.2	100.0	100.0	100.0	82.8
EUf (%)	1.1	0.9	0.5	2.3	8.9	100.0	100.0	10.4	2.9	26.8	0.0	0.0	21.2
PUf (%)	0.0	0.0	0.0	0.0	6.3	100.0	100.0	7.7	1.9	0.0	0.0	0.0	18.0
UCLF (%)	0.0	0.0	0.0	1.0	0.1	0.0	0.0	0.3	0.0	26.7	0.0	0.0	2.4
XUF (%)	1.1	0.9	0.5	1.3	2.6	0.0	0.0	2.5	1.0	0.1	0.0	0.0	0.8

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

REFERENCE UNIT POWER (NET) WAS INCREASED AFTER ANNUAL MAINTENANCE AND REFUELLING FROM 408 MW TO 410 MW (FROM 1.8.2008). MOST PART OF THE YEAR THE UNIT WAS INTEGRATED INTO ANCILLARY SERVICES.

## 5. Historical Summary

Date of Construction Start: 01 Dec 1976      Lifetime Generation: 64807.4 GW(e).h  
 Date of First Criticality: 02 Aug 1985      Cumulative Energy Availability Factor: 79.1%  
 Date of Grid Connection: 09 Aug 1985      Cumulative Load Factor: 77.1%  
 Date of Commercial Operation: 18 Dec 1985      Cumulative Unit Capability Factor: 82.3%  
    Cumulative Energy Unavailability Factor: 20.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	298.1	408.0	100.0	100.0	100.0	100.0	98.2	98.2	744	100.0
1986	2887.9	408.0	81.0	82.5	81.0	82.5	80.8	82.2	7294	83.3
1987	3084.7	408.0	86.6	84.5	86.1	84.2	86.3	84.2	7783	88.8
1988	2786.5	408.0	78.0	82.4	77.8	82.1	77.7	82.1	7248	82.5
1989	2827.7	408.0	80.0	81.8	79.2	81.4	79.1	81.3	7548	86.2
1990	2873.8	408.0	82.0	81.8	80.7	81.3	80.4	81.2	7427	84.8
1991	2850.5	408.0	82.9	82.0	80.4	81.1	79.8	80.9	7438	84.9
1992	2711.9	408.0	73.3	80.8	70.4	79.6	75.7	80.2	6714	76.4
1993	2847.6	408.0	82.6	81.0	79.7	79.6	79.7	80.1	7341	83.8
1994	2791.4	405.0	83.9	81.3	78.7	79.5	78.7	80.0	7389	84.3
1995	2823.7	408.0	88.5	82.0	79.3	79.5	79.0	79.9	7211	82.3
1996	2834.9	436.0	79.2	81.8	76.1	79.2	74.0	79.3	6953	79.2
1997	2953.5	440.0	84.7	82.0	80.2	79.3	76.6	79.1	7469	85.3
1998	2822.4	408.0	85.7	82.3	82.4	79.5	79.0	79.1	7525	85.9
1999	2656.5	408.0	81.7	82.2	75.1	79.2	74.3	78.7	7283	83.1
2000	2431.9	408.0	76.3	81.9	68.9	78.5	67.9	78.0	6791	77.3
2001	2793.3	408.0	86.7	82.2	79.2	78.6	78.2	78.0	7721	88.1
2002	2823.2	408.0	87.9	82.5	85.0	78.9	79.0	78.1	7742	88.4
2003	2814.9	408.0	87.8	82.8	84.4	79.2	78.8	78.1	7737	88.3
2004	2390.9	408.0	77.0	82.5	74.4	79.0	66.7	77.5	6786	77.3
2005	2841.0	408.0	87.3	82.7	84.3	79.2	79.5	77.6	7671	87.6
2006	2489.3	408.0	79.3	82.5	77.0	79.1	69.6	77.2	7035	80.3
2007	2648.5	408.0	79.9	82.4	78.0	79.1	74.1	77.1	7053	80.5
2008	2739.0	410.0	79.6	82.3	78.8	79.1	76.5	77.1	7254	82.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					50	
C. Inspection, maintenance or repair combined with refuelling	1524			1176		
D. Inspection, maintenance or repair without refuelling				61		
E. Testing of plant systems or component:	6			0		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					0	
Subtotal	1530	0	0	1237	50	0
Total	1530			1287		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		7
15. Reactor Cooling System:		0
16. Steam generation system:		30
17. Safety I&C Systems (excluding reactor I&C)		4
32. Feedwater and Main Steam System		4
33. Circulating Water System		0
35. All other I&C Systems		0
42. Electrical Power Supply System:		0
XX. Miscellaneous Systems		1
Total	0	46

## 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  
 at the beginning of 2008: 405.0 MW(e)  
 Design Net Capacity: 387.0 MW(e)  
 Design Discharge Burnup: 31000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 3329.4 GW(e).h  
 Energy Availability Factor: 90.6%  
 Load Factor: 89.8%  
 Operating Factor: 92.1%  
 Energy Unavailability Factor: 9.4%  
 Total Off-line Time: 696 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	299.8	285.4	299.1	0.8	294.1	299.7	316.1	316.1	300.2	311.2	292.3	314.8	3329.4
EAF (%)	99.5	99.4	98.2	1.6	97.2	96.1	98.7	99.2	96.7	99.6	96.4	99.1	90.6
UCF (%)	99.5	99.4	99.7	1.6	97.3	97.2	99.7	100.0	97.2	99.6	96.4	99.1	91.0
LF (%)	99.5	104.9	99.3	0.3	97.6	95.5	97.5	97.4	95.6	95.8	93.1	97.0	89.8
OF (%)	100.0	103.6	99.9	1.8	98.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.1
EUF (%)	0.5	0.6	1.8	98.4	2.8	3.9	1.3	0.8	3.3	0.4	3.6	0.9	9.4
PUF (%)	0.5	0.6	0.3	91.6	0.9	2.3	0.3	0.0	2.8	0.0	3.4	0.8	8.2
UCLF (%)	0.0	0.0	0.0	6.8	1.8	0.5	0.0	0.0	0.0	0.4	0.1	0.0	0.8
XUF (%)	0.0	0.0	1.4	0.0	0.1	1.1	1.0	0.8	0.6	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

FIRST UNIT OF MOCHOVCE NPP WAS OPERATED AT FULL POWER IN A BASE LOAD MODE. A LOAD-FOLLOWING HAS BEEN REQUIRED BY DISPATCHER FOR A PERIOD. UNIT PROVIDES GRID SUPPORTING SERVICES - SECONDARY POWER CONTROL FOR GRID ADJUSTMENT AND TERTIARY POWER CONTROL. DURING THE GENERAL OVERHAUL THE PRIMARY POWER CONTROL (GRID FREQUENCY CONTROL) AT BOTH TURBOGENERATORS HAS BEEN ACCOMPLISHED AS WELL. REACTOR POWER WAS UP-RATED TO 107% - FROM INITIAL 1375 MWTH TO 1471 MW THERMAL. SEVERAL PLANNED TESTS AT UP-RATED POWER WERE MADE. OVER THE REPORTING PERIOD THERE WERE FEW FORCED UNPLANNED POWER REDUCTIONS. THROUGHOUT THE YEAR THERE WAS THE UNEXPECTED DELAY OF TWO PLANNED OUTAGES: OF 1G09 AND OF CONDENSER TIGHTNESS CONTROL. THE REACTOR POWER DECREASE DURING THE LOSS OF RESERVE GRID 110 KV AT 1.ST UNIT WAS CLASSIFIED BY NATIONAL DISPATCHING AS EXTERNAL DUE TO GRID PROBLEMS. ONE MANUAL REACTOR SCRAM WAS DONE DUE TO AC POWER SUPPLY PROTECTION FALSE ACTUATION. OTHER FACTORS AFFECTING ENERGY GENERATION OVER THE REPORTING PERIOD WERE LIMITATIONS DUE TO FUEL MANAGEMENT AND ENVIRONMENTAL CONDITIONS (COOLING WATER TEMPERATURE LIMITS).

### 5. Historical Summary

Date of Construction Start: 01 Oct 1983      Lifetime Generation: 29522.4 GW(e).h  
 Date of First Criticality: 09 Jun 1998      Cumulative Energy Availability Factor: 82.1%  
 Date of Grid Connection: 04 Jul 1998      Cumulative Load Factor: 80.3%  
 Date of Commercial Operation: 29 Oct 1998      Cumulative Unit Capability Factor: 84.9%  
    Cumulative Energy Unavailability Factor: 17.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1998	784.8	408.0	97.9	97.9	96.7	96.7	87.1	87.1	2189	99.1
1999	2376.1	404.0	70.4	76.0	65.8	72.1	67.1	71.2	6397	73.0
2000	2816.9	404.0	90.0	82.2	79.4	75.3	79.4	74.8	8311	94.6
2001	2423.6	404.0	75.0	80.0	68.1	73.1	68.5	72.9	6648	75.9
2002	2914.8	405.0	86.3	81.5	83.3	75.5	82.2	75.1	7628	87.1
2003	2796.6	405.0	83.0	81.8	82.3	76.8	78.8	75.8	7324	83.6
2004	2996.0	405.0	88.6	82.8	88.1	78.6	84.2	77.1	7801	88.8
2005	2712.6	405.0	80.8	82.6	80.3	78.9	76.5	77.0	7128	81.4
2006	3059.7	405.0	90.7	83.5	90.0	80.2	86.2	78.2	7977	91.1
2007	3142.7	405.0	90.0	84.2	89.2	81.2	88.6	79.3	7954	90.8
2008	3329.4	436.0	91.0	84.9	90.6	82.1	89.8	80.3	8064	92.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1998 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		13			67	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	647			917		
D. Inspection, maintenance or repair without refuelling				37		
H. Nuclear regulatory requirement				25		
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			10		6	
L. Human factor related		49			1	
Subtotal	647	62	10	979	77	4
Total		719			1060	

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

System	2008 Hours Lost	1998 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		34
12. Reactor I&C Systems		5
14. Safety Systems		12
16. Steam generation system:		1
17. Safety I&C Systems (excluding reactor I&C)		4
41. Main Generator System:		1
42. Electrical Power Supply System:	13	7
Total	13	64

## 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  
 at the beginning of 2008: 405.0 MW(e)  
 Design Net Capacity: 387.0 MW(e)  
 Design Discharge Burnup: 31000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 3070.5 GW(e).h  
 Energy Availability Factor: 87.8%  
 Load Factor: 85.5%  
 Operating Factor: 89.0%  
 Energy Unavailability Factor: 12.2%  
 Total Off-line Time: 963 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	306.4	286.1	304.5	113.9	289.5	276.7	276.7	282.9	242.9	74.1	306.9	310.1	3070.5
EAF (%)	100.0	100.0	99.7	40.9	98.8	95.2	99.3	99.1	96.3	25.3	98.5	99.6	87.8
UCF (%)	100.0	100.0	99.7	41.1	99.7	97.8	100.0	100.0	96.3	25.5	98.6	99.7	88.3
LF (%)	101.7	105.1	101.0	39.1	96.1	94.9	91.8	93.9	83.3	24.6	97.8	95.6	85.5
OF (%)	100.0	103.6	99.9	42.6	100.0	97.8	100.0	100.0	96.7	28.5	100.0	100.0	89.0
EUF (%)	0.0	0.0	0.3	59.1	1.2	4.8	0.7	0.9	3.7	74.7	1.5	0.4	12.2
PUF (%)	0.0	0.0	0.0	58.3	0.0	0.0	0.0	0.0	3.7	74.6	1.4	0.3	11.4
UCLF (%)	0.0	0.0	0.3	0.6	0.3	2.2	0.0	0.0	0.0	0.0	0.0	0.1	0.3
XUF (%)	0.0	0.0	0.0	0.2	1.0	2.6	0.7	0.9	0.0	0.1	0.1	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

SECOND UNIT OF NPP MOCHOVCE WAS OPERATED LARGELY AT FULL POWER IN A BASE LOAD MODE. A LOAD-FOLLOWING HAS BEEN REQUIRED BY DISPATCHER FOR A PERIOD. UNIT PROVIDES GRID SUPPORTING SERVICES - SECONDARY POWER CONTROL FOR GRID ADJUSTMENT AND TERTIARY POWER CONTROL. DURING THE GENERAL OVERHAUL THE PRIMARY POWER CONTROL (GRID FREQUENCY CONTROL) AT BOTH TURBOGENERATORS HAS BEEN ACCOMPLISHED AS WELL. REACTOR POWER WAS UP-RATED TO 107% - FROM INITIAL 1375 MWTH TO 1471 MW THERMAL. SEVERAL PLANNED TESTS AT UP-RATED POWER WERE MADE. OVER THE REPORTING PERIOD THERE WERE A FEW HOURS OF UNPLANNED POWER DECREASE. THROUGHOUT THE YEAR THERE OCCURRED FALSE ACTUATION OF ELECTRICAL PROTECTIONS AND TG21 WAS TWICE DISCONNECTED FROM THE GRID. ONE AUTOMATIC REACTOR SCRAM OCCURRED DURING THE LOSS OF 400 KV GRID AT 2.ND UNIT. THIS WAS CLASSIFIED BY NATIONAL DISPATCHING AS INCORRECT ACTUATION OF UNIT'S ELECTRICAL PROTECTIONS DESPITE THE SIMULTANEOUS GRID PROBLEMS. ALL PLANNED MAINTENANCE ACTIVITIES WERE EARLIER ACCOMPLISHED AND JUST SPRING UNIT OUTAGE FOR INSPECTION OF COMMON SERVICE WATER SYSTEMS HAD STARTED ONE HOUR EARLIER THAN SCHEDULED. ADDITIONAL FACTOR AFFECTING ENERGY GENERATION OVER THE REPORTING PERIOD WERE LIMITATIONS DUE COOLING WATER TEMPERATURE LIMITS.

### 5. Historical Summary

Date of Construction Start: 01 Oct 1983      Lifetime Generation: 24789.1 GW(e).h  
 Date of First Criticality: 01 Dec 1999      Cumulative Energy Availability Factor: 83.1%  
 Date of Grid Connection: 20 Dec 1999      Cumulative Load Factor: 78.3%  
 Date of Commercial Operation: 11 Apr 2000      Cumulative Unit Capability Factor: 85.0%  
    Cumulative Energy Unavailability Factor: 16.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2000	2222.5	404.0	91.6	91.6	87.9	87.9	83.3	83.3	5912	89.6
2001	2540.9	404.0	78.2	83.9	72.1	78.9	71.8	76.8	6967	79.5
2002	2498.4	405.0	76.0	81.0	71.7	76.3	70.4	74.5	6862	78.3
2003	2964.9	405.0	87.8	82.9	87.4	79.2	83.6	76.9	7729	88.2
2004	2034.5	405.0	81.6	82.6	81.4	79.7	57.2	72.7	7210	82.1
2005	3050.9	405.0	89.5	83.8	88.5	81.2	86.0	75.0	7900	90.2
2006	2787.2	405.0	82.1	83.5	81.1	81.2	78.6	75.6	7254	82.8
2007	3191.3	405.0	91.3	84.5	90.8	82.4	90.0	77.4	8082	92.3
2008	3070.5	436.0	88.3	85.0	87.8	83.1	85.5	78.3	7797	89.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2000 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		16			67	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	557			910		
D. Inspection, maintenance or repair without refuelling	412			108		
L. Human factor related		1			3	
Subtotal	969	17	0	1018	70	0
Total		986			1088	

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

System	2008 Hours Lost	2000 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		7
15. Reactor Cooling System:		37
16. Steam generation system:		4
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries:		3
33. Circulating Water System:		1
41. Main Generator System:	16	6
42. Electrical Power Supply System:		3
Total	16	64

# SI-1 KRSKO

**Operator:** NEK (Nuklearna elektrarna Krško)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 666.0 MW(e)  
**Design Net Capacity:** 632.0 MW(e)  
**Design Discharge Burnup:** 44000 MW.d/t  
**Status at end of year:** Operational

## 2. Production Summary 2008

**Net Energy Production:** 5972.0 GW(e).h  
**Energy Availability Factor:** 98.6%  
**Load Factor:** 102.4%  
**Operating Factor:** 98.9%  
**Energy Unavailability Factor:** 1.4%  
**Total Off-line Time:** 100 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	516.5	482.6	515.6	499.7	513.8	408.6	507.7	507.5	492.9	511.1	499.9	516.3	5972.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	82.8	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	100.0	82.8	100.0	100.0	100.0	100.0	100.0	100.0	98.6
<b>LF (%)</b>	104.2	107.8	104.1	104.3	103.7	85.2	102.5	102.4	102.8	103.0	104.2	104.2	102.4
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	82.8	100.0	100.0	100.0	99.9	100.0	100.0	98.9
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	17.2	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	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	17.2	0.0	0.0	0.0	0.0	0.0	0.0	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. 2008 Summary of Operation

IN 2008 THE POWER PLANT HAD ONE UNPLANNED SHUTDOWN. ON 4 JUNE 2008 OPERATORS DETECTED AN INCREASED LEAKAGE OF WATER FROM THE PRIMARY SYSTEM INSIDE THE CONTAINMENT. THE PLANT STARTED TO DECREASE POWER AT A STEADY RATE UNTIL SHUT DOWN. IT WAS FOUND OUT THAT THE SEAL DEGRADED ON A VALVE ON ONE OF THE SMALLER PIPES, WHICH WERE CONNECTED TO THE PRIMARY SYSTEM. IN 2008 THERE WAS NO REFUELING OUTAGE.

## 5. Historical Summary

**Date of Construction Start:** 30 Mar 1975  
**Date of First Criticality:** 11 Sep 1981  
**Date of Grid Connection:** 02 Oct 1981  
**Date of Commercial Operation:** 01 Jan 1983

**Lifetime Generation:** 122378.7 GW(e).h  
**Cumulative Energy Availability Factor:** 83.5%  
**Cumulative Load Factor:** 82.4%  
**Cumulative Unit Capability Factor:** 84.9%  
**Cumulative Energy Unavailability Factor:** 16.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	3724.1	632.0	69.6	69.6	69.6	69.6	67.3	67.3	6255	71.4
1984	4207.6	632.0	79.8	74.7	79.8	74.7	75.8	71.5	7073	80.5
1985	3845.3	632.0	72.1	73.8	72.1	73.8	69.5	70.8	6421	73.3
1986	3822.0	620.0	74.8	74.1	73.7	73.8	70.4	70.7	6561	74.9
1987	4278.8	620.0	83.5	76.0	83.5	75.7	78.8	72.3	7287	83.2
1988	3935.8	620.0	77.0	76.1	76.9	75.9	72.3	72.3	6866	78.2
1989	4453.9	620.0	85.5	77.4	85.2	77.2	82.0	73.7	7500	85.6
1990	4386.8	620.0	87.1	78.6	85.4	78.3	80.8	74.6	7592	86.7
1991	4718.2	632.0	94.6	80.4	88.7	79.4	85.2	75.8	8133	92.8
1992	3767.2	632.0	74.0	79.8	68.6	78.3	67.9	75.0	6699	76.3
1993	3762.8	620.0	72.5	79.1	69.3	77.5	69.3	74.4	6493	74.1
1994	4403.5	620.0	82.1	79.4	81.1	77.8	81.1	75.0	7402	84.5
1995	4568.5	620.0	85.1	79.8	84.1	78.3	84.1	75.7	7606	86.8
1996	4361.6	620.0	79.6	79.8	79.6	78.4	80.1	76.0	7143	81.3
1997	4794.0	620.0	88.3	80.4	87.8	79.0	88.3	76.8	7824	89.3
1998	4793.6	620.0	89.5	80.9	88.0	79.6	88.3	77.5	7913	90.3
1999	4492.4	620.0	84.7	81.2	82.4	79.7	82.7	77.8	7480	85.4
2000	4548.8	646.0	82.6	81.2	80.5	79.8	80.1	78.0	7295	83.0
2001	5036.3	656.0	88.4	81.6	86.2	80.1	87.6	78.5	7790	88.9
2002	5308.8	676.0	92.0	82.2	91.1	80.7	89.6	79.1	8111	92.6
2003	4963.3	676.0	91.6	82.7	86.2	81.0	83.8	79.3	8084	92.3
2004	5212.2	676.0	91.4	83.1	89.9	81.4	87.8	79.7	8081	92.0
2005	5613.7	656.0	98.5	83.8	98.3	82.2	97.7	80.6	8664	98.9
2006	5289.5	656.0	90.1	84.1	89.9	82.5	91.3	81.0	7883	90.0
2007	5428.2	666.0	91.0	84.4	90.9	82.9	93.0	81.5	7989	91.2
2008	5972.0	666.0	98.6	84.9	98.6	83.5	102.4	82.4	8660	98.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		124			129	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling				912		
D. Inspection, maintenance or repair without refuelling				172		
E. Testing of plant systems or component				53	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				24		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						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	0	124	0	1161	131	0
Total		124			1292	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	124	
12. Reactor I&C Systems		2
14. Safety Systems		3
15. Reactor Cooling System		15
16. Steam generation system		15
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		42
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator System		4
42. Electrical Power Supply System		15
Total	124	124

# ZA-1 KOEBERG-1

Operator: ESKOM (ESKOM)

Contractor: FRAM (FRAMATOME)

## 1. Station Details

Type: PWR

Net Reference Unit Power  
at the beginning of 2008: 900.0 MW(e)

Design Net Capacity: 921.0 MW(e)

Design Discharge Burnup: 36500 MW.d/t

Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 7691.9 GW(e).h

Energy Availability Factor: 98.3%

Load Factor: 97.6%

Operating Factor: 99.2%

Energy Unavailability Factor: 1.7%

Total Off-line Time: 71 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	663.4	619.6	606.8	640.9	660.8	640.7	645.7	636.1	641.6	631.2	641.5	663.7	7691.9
EAF (%)	100.0	100.0	91.8	100.0	100.0	100.0	97.3	95.9	100.0	95.2	100.0	100.0	98.3
UCF (%)	100.0	100.0	91.8	100.0	100.0	100.0	97.3	95.9	100.0	95.2	100.0	100.0	98.3
LF (%)	99.1	102.4	90.6	99.0	98.7	98.9	96.4	95.0	99.0	94.1	99.0	99.1	97.6
OF (%)	100.0	103.6	94.1	100.1	100.0	100.0	98.4	98.1	100.0	96.5	100.0	100.0	99.2
EUF (%)	0.0	0.0	8.2	0.0	0.0	0.0	2.7	4.1	0.0	4.8	0.0	0.0	1.7
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	8.2	0.0	0.0	0.0	2.7	4.1	0.0	4.8	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. 2008 Summary of Operation

ON 6 NOVEMBER 2008 IT HAS BEEN 7 YEARS WITHOUT A AUTOMATIC REACTOR SCRAM

## 5. Historical Summary

Date of Construction Start: 01 Jul 1976      Lifetime Generation: 134784.0 GW(e).h

Date of First Criticality: 14 Mar 1984      Cumulative Energy Availability Factor: 71.3%

Date of Grid Connection: 04 Apr 1984      Cumulative Load Factor: 68.7%

Date of Commercial Operation: 21 Jul 1984      Cumulative Unit Capability Factor: 76.1%

   Cumulative Energy Unavailability Factor: 28.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	3441.3	920.0	90.6	90.6	88.8	88.8	84.7	84.7	4110	93.1
1985	4004.3	920.0	53.5	65.9	53.5	65.3	49.7	61.4	4986	56.9
1986	3419.0	922.0	53.6	61.0	53.6	60.6	42.3	53.8	4575	52.2
1987	2864.5	920.0	61.6	61.2	61.6	60.9	35.5	48.6	4337	49.5
1988	5964.4	920.0	76.0	64.5	76.0	64.3	73.8	54.2	6791	77.3
1989	4498.1	922.0	63.2	64.2	63.2	64.1	55.2	54.4	5655	64.0
1990	3852.1	920.0	61.7	63.9	52.7	62.3	47.8	53.4	5360	61.2
1991	5976.8	920.0	76.3	65.5	74.6	64.0	74.2	56.1	6886	78.6
1992	3992.5	920.0	63.6	65.3	50.3	62.4	49.4	55.3	5697	64.9
1993	4097.9	920.0	66.4	65.4	50.5	61.1	50.8	54.9	6010	68.6
1994	5933.9	920.0	95.6	68.3	74.9	62.4	73.6	56.7	8422	96.1
1995	4576.9	920.0	65.7	68.1	56.8	61.9	56.7	56.7	5853	66.8
1996	5672.8	920.0	81.8	69.2	70.4	62.6	70.2	57.7	7260	82.7
1997	6610.7	920.0	87.4	70.5	82.3	64.1	82.0	59.5	7676	87.6
1998	7248.3	920.0	97.6	72.4	90.1	65.9	89.9	61.6	8552	97.6
1999	7051.7	920.0	88.1	73.4	83.3	67.0	87.5	63.3	7848	89.6
2000	5629.2	920.0	73.4	73.4	70.2	67.2	69.8	63.7	7250	82.7
2001	6042.5	920.0	83.0	73.9	77.1	67.7	75.0	64.3	7303	83.4
2002	7328.6	900.0	95.2	75.1	93.1	69.1	93.0	65.9	8417	96.1
2003	6413.4	900.0	84.1	75.5	81.9	69.7	81.3	66.6	7398	84.5
2004	6388.0	900.0	81.6	75.8	81.1	70.3	80.8	67.3	7358	83.8
2005	5821.0	900.0	76.8	75.8	74.7	70.5	73.8	67.6	6726	76.8
2006	4682.8	900.0	61.0	75.2	59.8	70.0	59.4	67.2	5435	62.0
2007	5747.0	900.0	74.4	75.2	73.6	70.2	72.9	67.5	6609	75.4
2008	7691.9	900.0	98.3	76.1	98.3	71.3	97.6	68.7	8689	99.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		83			349	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling				1183	13	
D. Inspection, maintenance or repair without refuelling				173		
E. Testing of plant systems or component				4	0	14
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				64	31	
L. Human factor related		12				
Z. Others					23	
Subtotal	0	95	0	1424	425	14
Total		95			1863	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		7
13. Reactor Auxiliary System		1
14. Safety Systems		3
15. Reactor Cooling System		56
16. Steam generation system		0
31. Turbine and auxiliaries	25	43
32. Feedwater and Main Steam System	58	23
33. Circulating Water System		2
41. Main Generator System		162
42. Electrical Power Supply System		47
Total	83	344

**ZA-2 KOEBERG-2**

Operator: ESKOM (ESKOM)

Contractor: FRAM (FRAMATOME)

**1. Station Details**

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 900.0 MW(e)  
 Design Net Capacity: 921.0 MW(e)  
 Design Discharge Burnup: 36500 MW.d/t  
 Status at end of year: Operational

**2. Production Summary 2008**

Net Energy Production: 5055.9 GW(e).h  
 Energy Availability Factor: 64.1%  
 Load Factor: 64.1%  
 Operating Factor: 68.0%  
 Energy Unavailability Factor: 35.9%  
 Total Off-line Time: 2800 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	272.4	0.0	0.0	271.6	661.3	645.7	459.0	379.1	645.7	669.5	435.8	615.7	5055.9
EAF (%)	40.9	-3.6	0.0	42.6	99.0	100.0	68.8	56.8	100.0	100.0	67.6	92.2	64.1
UCF (%)	65.0	-3.6	0.0	42.6	99.0	100.0	68.8	56.9	100.0	100.0	67.6	92.2	66.1
LF (%)	40.7	0.0	0.0	42.0	98.8	99.7	68.5	56.6	99.6	99.9	67.3	92.0	64.1
OF (%)	64.9	0.0	0.0	57.0	100.0	100.0	69.6	58.1	100.0	99.9	68.6	93.4	68.0
EUF (%)	59.1	103.6	100.0	57.4	1.0	0.0	31.2	43.2	0.0	0.0	32.4	7.8	35.9
PUF (%)	35.0	103.6	100.0	49.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.4
UCLF (%)	0.0	0.0	0.0	8.3	1.0	0.0	31.2	43.2	0.0	0.0	32.4	7.8	10.4
XUF (%)	24.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0

UCLF replaces previously used UUF.

**4. 2008 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Jul 1976      Lifetime Generation: 127518.0 GW(e).h  
 Date of First Criticality: 07 Jul 1985      Cumulative Energy Availability Factor: 69.6%  
 Date of Grid Connection: 25 Jul 1985      Cumulative Load Factor: 68.2%  
 Date of Commercial Operation: 09 Nov 1985      Cumulative Unit Capability Factor: 76.7%  
    Cumulative Energy Unavailability Factor: 30.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	483.7	920.0	37.2	37.2	37.2	37.2	35.9	35.9	555	37.9
1986	5409.0	922.0	67.4	63.1	67.3	63.0	67.0	62.5	5969	68.1
1987	3352.8	920.0	48.6	56.4	48.6	56.4	41.6	52.9	4193	47.9
1988	4552.7	920.0	63.1	58.5	63.1	58.5	56.3	54.0	5626	64.0
1989	6620.2	922.0	89.2	65.9	89.2	65.9	81.3	60.6	8115	91.9
1990	4614.3	920.0	64.8	65.7	58.4	64.5	57.3	59.9	5933	67.7
1991	3191.9	920.0	56.3	64.2	40.3	60.6	39.6	56.6	5067	57.8
1992	5308.1	920.0	94.9	68.5	66.3	61.4	65.7	57.9	8439	96.1
1993	3212.3	920.0	52.6	66.5	40.4	58.8	39.9	55.7	4654	53.1
1994	3755.9	920.0	69.2	66.8	49.5	57.8	46.6	54.7	5944	67.9
1995	6710.5	920.0	98.6	69.9	83.2	60.3	83.3	57.5	8640	98.6
1996	6084.9	920.0	81.5	71.0	75.8	61.7	75.3	59.1	7177	81.7
1997	6016.4	920.0	83.8	72.0	75.2	62.8	74.7	60.4	7409	84.6
1998	6333.0	920.0	81.3	72.7	79.0	64.0	78.6	61.8	7194	82.1
1999	6413.9	920.0	86.2	73.7	75.7	64.8	79.6	63.0	7509	85.7
2000	7365.9	920.0	98.1	75.3	91.2	66.6	91.1	64.9	8687	98.9
2001	4662.8	920.0	66.5	74.8	60.1	66.2	57.9	64.4	5461	62.3
2002	4688.8	900.0	60.6	73.9	59.6	65.8	59.5	64.2	5439	62.1
2003	6255.5	900.0	82.9	74.4	79.4	66.5	79.3	65.0	7150	81.6
2004	7896.7	900.0	99.8	75.7	99.8	68.2	99.9	66.8	8784	100.0
2005	6416.8	900.0	84.2	76.1	81.5	68.9	81.4	67.5	7330	83.7
2006	5391.4	900.0	81.3	76.4	71.4	69.0	68.4	67.5	7003	79.9
2007	6853.9	900.0	95.3	77.2	87.3	69.8	86.9	68.4	8422	96.1
2008	5055.9	900.0	66.1	76.7	64.1	69.6	64.1	68.2	5960	68.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		813			331	13
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	2011			826	31	
D. Inspection, maintenance or repair without refuelling				35		
E. Testing of plant systems or component				43	0	
G. Major back-fitting, refurbishment or upgrading activities without refuelling						0
H. Nuclear regulatory requirement					0	
J. Grid limitation, failure or grid unavailability					0	11
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					78	3
L. Human factor related					3	
Subtotal	2011	813	0	904	449	27
Total		2824			1380	

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		10
14. Safety Systems	275	49
15. Reactor Cooling System:		12
16. Steam generation system:		46
31. Turbine and auxiliaries		21
32. Feedwater and Main Steam System		17
33. Circulating Water System		3
35. All other I&C Systems:		1
41. Main Generator System:	538	18
42. Electrical Power Supply System:	0	163
Total	813	340



## ES-6 ALMARAZ-1

**Operator:** CNAT (CENTRALES NUCLEARES ALMARAZ-TRILLO(ID/UFG/ENDESA/HC/NUCLENOR ))

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 944.0 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 2008

**Net Energy Production:** 7190.8 GW(e).h  
**Energy Availability Factor:** 86.6%  
**Load Factor:** 87.0%  
**Operating Factor:** 88.2%  
**Energy Unavailability Factor:** 13.4%  
**Total Off-line Time:** 1035 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	703.5	658.4	697.5	286.4	55.4	673.0	690.4	668.6	667.4	697.6	682.4	710.2	7190.8
<b>EAF (%)</b>	100.0	100.0	99.3	42.0	7.8	100.0	98.3	95.2	98.1	99.2	100.0	100.0	86.6
<b>UCF (%)</b>	100.0	100.0	100.0	42.2	7.8	100.0	100.0	97.3	99.9	99.2	100.0	100.0	87.1
<b>LF (%)</b>	100.2	103.8	99.3	42.2	7.9	99.0	98.3	95.2	98.2	99.2	100.4	101.1	87.0
<b>OF (%)</b>	100.0	103.6	99.9	43.1	12.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.2
<b>EUf (%)</b>	0.0	0.0	0.7	58.0	92.2	0.0	1.7	4.8	1.9	0.8	0.0	0.0	13.4
<b>PUf (%)</b>	0.0	0.0	0.0	57.8	68.7	0.0	0.0	2.6	0.0	0.0	0.0	0.0	10.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	23.5	0.0	0.0	0.2	0.1	0.9	0.0	0.0	2.1
<b>XUF (%)</b>	0.0	0.0	0.7	0.2	0.0	0.0	1.7	2.1	1.8	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

UNIT IN NINETEENTH REFUELLING FROM APRIL 13 AFTER COUPLED FIVE HUNDRED TWENTY-FOUR DAYS.

### 5. Historical Summary

**Date of Construction Start:** 02 Jul 1973 **Lifetime Generation:** 179874.0 GW(e).h  
**Date of First Criticality:** 05 Apr 1981 **Cumulative Energy Availability Factor:** 85.5%  
**Date of Grid Connection:** 01 May 1981 **Cumulative Load Factor:** 85.6%  
**Date of Commercial Operation:** 01 Sep 1983 **Cumulative Unit Capability Factor:** 86.4%  
**Cumulative Energy Unavailability Factor:** 14.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	2135.5	930.0	78.4	78.4	78.4	78.4	78.4	78.4	2597	88.7
1984	4820.5	893.0	65.0	68.5	65.0	68.5	61.5	65.8	6062	69.0
1985	4825.2	900.0	61.6	65.6	61.6	65.6	61.2	63.8	5705	65.1
1986	5425.0	900.0	69.3	66.7	69.3	66.7	68.8	65.3	6418	73.3
1987	7193.7	900.0	92.5	72.6	92.5	72.6	91.2	71.3	8346	95.3
1988	5879.6	900.0	74.6	73.0	74.6	73.0	74.4	71.9	6899	78.5
1989	6562.2	895.0	83.2	74.6	83.2	74.6	83.7	73.7	7640	87.2
1990	6460.7	895.0	82.2	75.6	82.2	75.6	82.4	74.9	7451	85.1
1991	7481.7	895.0	96.2	78.1	96.2	78.1	95.4	77.4	8589	98.0
1992	6379.1	895.0	80.8	78.4	80.8	78.4	81.1	77.8	7387	84.1
1993	6530.9	895.0	85.1	79.0	83.2	78.8	83.3	78.3	7663	87.5
1994	7448.6	895.0	95.9	80.5	95.1	80.3	95.0	79.8	8495	97.0
1995	6588.5	895.0	86.2	81.0	83.7	80.5	84.0	80.1	7709	88.0
1996	5904.3	895.0	73.8	80.4	72.5	79.9	75.1	79.7	6789	77.3
1997	6642.8	895.0	83.0	80.6	79.6	79.9	84.7	80.1	7371	84.1
1998	8032.5	944.0	98.8	81.8	97.1	81.1	97.1	81.2	8760	100.0
1999	6988.6	927.0	85.4	82.1	84.7	81.3	86.1	81.6	7613	86.9
2000	7471.6	927.0	91.1	82.6	90.3	81.9	91.8	82.2	8014	91.2
2001	8151.4	927.0	99.6	83.6	99.0	82.8	100.4	83.2	8749	99.9
2002	7428.0	944.0	92.2	84.0	90.4	83.2	89.8	83.5	8100	92.5
2003	7499.1	944.0	93.8	84.5	91.6	83.6	90.7	83.9	8233	94.0
2004	8185.7	944.0	99.9	85.3	99.2	84.4	98.7	84.6	8784	100.0
2005	7519.4	944.0	93.1	85.6	91.4	84.7	90.9	84.9	8180	93.4
2006	7152.4	944.0	88.1	85.7	86.5	84.8	86.5	85.0	7831	89.4
2007	8189.8	944.0	99.9	86.3	99.0	85.4	99.0	85.6	8760	100.0
2008	7190.8	944.0	87.1	86.4	86.6	85.5	87.0	85.6	7725	88.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		174		4	123	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	885			718		
D. Inspection, maintenance or repair without refuelling				210		
E. Testing of plant systems or component:				62	0	
H. Nuclear regulatory requirement					2	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	
L. Human factor related					2	
Subtotal	885	174	0	994	128	0
Total		1059			1122	

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		13
13. Reactor Auxiliary System:	174	34
15. Reactor Cooling System:		17
16. Steam generation system:		0
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries:		5
32. Feedwater and Main Steam System		23
33. Circulating Water System		1
41. Main Generator System:		6
42. Electrical Power Supply System:		24
Total	174	123

## ES-7 ALMARAZ-2

**Operator:** CNAT (CENTRALES NUCLEARES ALMARAZ-TRILLO(ID/UFG/ENDESA/HC/NUCLENOR ))

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power at the beginning of 2008:** 956.0 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 2008

**Net Energy Production:** 8331.7 GW(e).h  
**Energy Availability Factor:** 99.2%  
**Load Factor:** 99.5%  
**Operating Factor:** 100.3%  
**Energy Unavailability Factor:** 0.8%  
**Total Off-line Time:** -24 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	712.6	666.7	710.9	688.3	710.1	678.6	694.7	693.4	672.7	705.3	685.7	712.6	8331.7
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	98.6	97.7	97.5	97.8	99.1	100.0	100.0	99.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>LF (%)</b>	100.2	103.8	99.9	100.1	99.8	98.6	97.7	97.5	97.7	99.0	99.6	100.2	99.5
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.3
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	1.4	2.3	2.5	2.2	0.9	0.0	0.0	0.8
<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	0.2	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	1.2	2.3	2.5	2.2	0.9	0.0	0.0	0.8

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THIS UNIT WAS OVER THE YEARS COUPLED AT 100% POWER.

### 5. Historical Summary

**Date of Construction Start:** 02 Jul 1973 **Lifetime Generation:** 176466.0 GW(e).h  
**Date of First Criticality:** 19 Sep 1983 **Cumulative Energy Availability Factor:** 87.3%  
**Date of Grid Connection:** 08 Oct 1983 **Cumulative Load Factor:** 87.5%  
**Date of Commercial Operation:** 01 Jul 1984 **Cumulative Unit Capability Factor:** 88.4%  
**Cumulative Energy Unavailability Factor:** 12.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	3204.9	893.0	86.0	86.0	86.0	86.0	81.3	81.3	3989	90.3
1985	6236.1	900.0	79.8	81.9	79.8	81.9	79.1	79.8	7297	83.3
1986	5825.2	900.0	75.2	79.2	75.2	79.2	73.9	77.4	7136	81.5
1987	6402.5	900.0	81.8	80.0	81.8	80.0	81.2	78.5	7351	83.9
1988	6809.4	900.0	86.3	81.4	86.3	81.4	86.1	80.2	7838	89.2
1989	6545.7	895.0	82.8	81.6	82.8	81.6	83.5	80.8	7638	87.2
1990	7649.3	895.0	97.4	84.0	97.4	84.0	97.6	83.4	8652	98.8
1991	6812.9	895.0	85.4	84.2	85.4	84.2	86.9	83.8	7712	88.0
1992	6892.7	895.0	87.3	84.6	87.3	84.6	87.7	84.3	7997	91.0
1993	7710.1	895.0	99.0	86.1	98.5	86.0	98.3	85.8	8760	100.0
1994	6384.6	895.0	84.2	85.9	80.9	85.6	81.4	85.4	7562	86.3
1995	6814.7	895.0	89.1	86.2	86.2	85.6	86.9	85.5	7952	90.8
1996	7273.3	895.0	91.6	86.6	91.5	86.1	92.5	86.1	8108	92.3
1997	6042.5	895.0	76.6	85.9	72.6	85.1	77.1	85.4	6811	77.8
1998	5892.4	953.0	75.9	85.2	70.2	84.0	70.6	84.3	6810	77.7
1999	8126.6	936.0	98.0	86.0	97.4	84.9	99.1	85.3	8743	99.8
2000	7401.8	936.0	90.6	86.3	88.5	85.1	90.0	85.6	8160	92.9
2001	7601.5	936.0	92.1	86.6	91.3	85.5	92.7	86.0	8189	93.5
2002	8154.9	953.0	98.8	87.3	98.1	86.2	97.7	86.7	8760	100.0
2003	6627.9	953.0	81.9	87.0	79.9	85.9	79.4	86.3	7391	84.4
2004	7563.2	953.0	91.6	87.3	90.9	86.1	90.3	86.5	8083	92.0
2005	8253.3	956.0	100.0	87.9	99.2	86.8	98.6	87.1	8760	100.0
2006	7250.1	956.0	87.7	87.9	86.8	86.8	86.6	87.1	7747	88.4
2007	7191.7	956.0	87.1	87.9	86.0	86.7	85.9	87.0	7668	87.5
2008	8331.7	956.0	100.0	88.4	99.2	87.3	99.5	87.5	8784	100.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					134	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling				635		
D. Inspection, maintenance or repair without refuelling				24		
E. Testing of plant systems or component:				33		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					7	
L. Human factor related					0	
Z. Others					4	
Subtotal	0	0	0	692	153	0
Total	0			845		

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems:		9
13. Reactor Auxiliary System:		3
14. Safety Systems:		1
15. Reactor Cooling System:		4
16. Steam generation system:		22
31. Turbine and auxiliaries:		32
32. Feedwater and Main Steam System:		23
35. All other I&C Systems:		0
41. Main Generator System:		1
42. Electrical Power Supply System:		33
Total	0	128

## ES-8 ASCO-1

**Operator:** ANAV (ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID))

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7436.3 GW(e).h  
**Energy Availability Factor:** 85.2%  
**Load Factor:** 85.3%  
**Operating Factor:** 88.7%  
**Energy Unavailability Factor:** 14.8%  
**Total Off-line Time:** 992 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	724.3	676.2	718.2	704.8	726.3	210.8	143.7	705.6	656.6	726.7	710.2	733.0	7436.3
<b>EAF (%)</b>	98.6	98.3	97.9	98.9	98.4	27.6	18.2	96.0	92.0	98.5	99.3	99.1	85.2
<b>UCF (%)</b>	99.9	99.9	99.9	99.8	99.5	28.1	18.2	97.7	93.8	99.9	99.9	99.8	86.3
<b>LF (%)</b>	97.8	101.1	97.0	98.5	98.1	29.4	19.4	95.3	91.6	98.0	99.1	99.0	85.3
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	31.5	34.0	100.0	95.6	100.0	100.0	100.0	88.7
<b>EUF (%)</b>	1.4	1.7	2.1	1.1	1.6	72.4	81.8	4.0	8.0	1.5	0.7	0.9	14.8
<b>PUF (%)</b>	0.1	0.1	0.1	0.1	0.1	71.9	0.0	0.1	0.1	0.1	0.1	0.1	6.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.1	0.4	0.0	81.8	2.2	6.1	0.0	0.0	0.0	7.7
<b>XUF (%)</b>	1.3	1.5	2.0	0.9	1.1	0.5	0.0	1.7	1.8	1.4	0.5	0.7	1.1

UCLF replaces previously used UUF.

### 4. 2008 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:** 172139.3 GW(e).h  
**Cumulative Energy Availability Factor:** 85.2%  
**Cumulative Load Factor:** 84.1%  
**Cumulative Unit Capability Factor:** 85.7%  
**Cumulative Energy Unavailability Factor:** 14.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	104.0	887.0	20.0	20.0	20.0	20.0	15.8	15.8	161	21.6
1985	4429.4	898.0	60.3	57.2	60.3	57.2	56.3	53.2	5342	61.0
1986	5129.0	898.0	68.2	62.5	68.2	62.5	65.2	58.9	6208	70.9
1987	6392.0	898.0	84.3	69.5	83.7	69.3	81.3	66.2	7569	86.4
1988	6669.0	898.0	84.1	73.1	84.1	73.0	84.5	70.7	7599	86.5
1989	6750.0	930.0	86.1	75.7	86.0	75.6	82.9	73.1	7771	88.7
1990	6642.0	930.0	84.5	77.2	84.5	77.1	81.5	74.6	7699	87.9
1991	6836.0	930.0	87.2	78.6	87.0	78.5	83.9	75.9	7810	89.2
1992	6875.0	887.0	86.5	79.6	86.5	79.5	88.2	77.4	7898	89.9
1993	6599.0	930.0	83.3	80.0	83.2	79.9	81.0	77.8	7401	84.5
1994	6868.0	930.0	87.1	80.7	86.8	80.6	84.3	78.5	7758	88.6
1995	5708.0	900.0	70.7	79.8	70.4	79.7	72.4	77.9	6387	72.9
1996	7972.0	947.0	99.0	81.5	99.0	81.4	95.8	79.5	8755	99.7
1997	6411.0	915.0	80.5	81.4	77.6	81.1	80.0	79.5	7198	82.2
1998	7349.0	949.0	89.3	82.0	89.1	81.7	88.4	80.2	7943	90.7
1999	8147.0	945.0	99.0	83.2	98.7	82.8	98.4	81.4	8741	99.8
2000	7681.0	979.0	89.8	83.6	89.5	83.3	89.3	81.9	8008	91.2
2001	7798.0	991.0	90.3	84.0	89.8	83.7	89.8	82.4	8056	92.0
2002	8397.0	998.0	98.2	84.9	97.6	84.5	96.0	83.2	8737	99.7
2003	7581.1	996.0	88.0	85.0	87.3	84.7	86.9	83.4	7900	90.2
2004	7734.3	995.0	89.2	85.3	88.6	84.9	88.5	83.7	7949	90.5
2005	7640.5	995.0	89.0	85.4	88.2	85.0	87.7	83.9	8548	97.6
2006	7418.4	995.0	87.1	85.5	85.4	85.1	85.1	83.9	7971	91.0
2007	7574.8	995.0	88.6	85.7	87.4	85.2	86.9	84.1	7876	89.9
2008	7436.3	995.0	86.3	85.7	85.2	85.2	85.3	84.1	7768	88.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		545			215	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling				806	1	
D. Inspection, maintenance or repair without refuelling	504			17		
E. Testing of plant systems or component				64	5	
J. Grid limitation, failure or grid unavailability						5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					7	0
L. Human factor related				6	1	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Others					1	
Subtotal	504	545	0	893	233	6
Total		1049			1132	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary System		0
15. Reactor Cooling System		12
16. Steam generation system		10
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		9
31. Turbine and auxiliaries	62	11
32. Feedwater and Main Steam System		12
35. All other I&C Systems		1
41. Main Generator System		87
42. Electrical Power Supply System	483	62
XX. Miscellaneous Systems		2
Total	545	209

## ES-9 ASCO-2

**Operator:** ANAV (ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID))

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7123.6 GW(e).h  
**Energy Availability Factor:** 82.0%  
**Load Factor:** 81.3%  
**Operating Factor:** 84.4%  
**Energy Unavailability Factor:** 18.0%  
**Total Off-line Time:** 1371 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	721.7	672.4	715.6	701.0	722.8	698.3	719.8	716.4	695.8	548.8	0.0	211.0	7123.6
<b>EAF (%)</b>	98.6	98.3	98.0	98.9	98.3	98.1	98.0	98.0	98.0	74.4	-3.0	28.1	82.0
<b>UCF (%)</b>	99.9	99.9	99.9	99.9	99.9	99.6	99.8	99.8	99.9	75.6	-3.0	28.2	83.3
<b>LF (%)</b>	97.3	96.9	96.5	97.7	97.4	97.3	97.0	96.6	96.9	74.0	0.0	28.4	81.3
<b>OF (%)</b>	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	77.4	0.0	35.2	84.4
<b>EUUF (%)</b>	1.4	1.7	2.0	1.1	1.7	1.9	2.0	2.0	2.0	25.6	103.0	71.9	18.0
<b>PUF (%)</b>	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	24.4	89.3	4.7	9.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	13.7	67.1	6.8
<b>XUF (%)</b>	1.3	1.5	1.9	1.0	1.6	1.5	1.8	1.8	1.9	1.2	0.0	0.1	1.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 07 Mar 1975  
**Date of First Criticality:** 11 Sep 1985  
**Date of Grid Connection:** 23 Oct 1985  
**Date of Commercial Operation:** 31 Mar 1986

**Lifetime Generation:** 164393.0 GW(e).h  
**Cumulative Energy Availability Factor:** 87.4%  
**Cumulative Load Factor:** 86.1%  
**Cumulative Unit Capability Factor:** 88.1%  
**Cumulative Energy Unavailability Factor:** 12.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	4977.0	898.0	79.3	79.3	79.3	79.3	75.5	75.5	5907	80.4
1987	5954.0	898.0	78.1	78.7	77.3	78.2	75.7	75.6	7035	80.3
1988	6865.0	898.0	88.2	82.0	86.8	81.2	87.0	79.6	7874	89.6
1989	6732.0	930.0	86.3	83.2	85.7	82.4	82.6	80.4	7729	88.2
1990	6933.0	930.0	90.4	84.7	90.4	84.1	85.1	81.4	7916	90.4
1991	6820.0	930.0	86.7	85.1	86.5	84.5	83.7	81.8	7799	89.0
1992	7077.0	953.0	89.9	85.8	89.9	85.3	84.5	82.2	8042	91.6
1993	7052.0	930.0	90.0	86.3	88.6	85.8	86.6	82.8	7897	90.1
1994	7085.0	930.0	89.8	86.7	89.5	86.2	87.0	83.3	7962	90.9
1995	6977.0	900.0	86.4	86.7	86.3	86.2	88.5	83.8	7674	87.6
1996	6011.0	963.0	75.6	85.6	75.1	85.1	71.1	82.6	6825	77.7
1997	7916.0	900.0	98.2	86.7	96.2	86.0	100.4	84.0	8725	99.6
1998	7399.0	946.0	90.6	87.0	89.9	86.3	89.3	84.4	8050	91.9
1999	7215.0	946.0	87.2	87.0	86.4	86.3	87.1	84.6	7854	89.7
2000	8451.0	983.0	98.6	87.8	98.6	87.2	97.9	85.6	8734	99.4
2001	7829.0	983.0	91.0	88.0	90.6	87.4	90.9	85.9	8102	92.5
2002	7780.0	997.0	90.8	88.2	89.4	87.6	89.1	86.1	8127	92.8
2003	8521.2	997.0	99.6	88.9	98.7	88.2	97.6	86.8	8738	99.7
2004	6909.3	997.0	80.2	88.4	79.6	87.7	78.9	86.4	7287	83.0
2005	7418.9	997.0	86.8	88.3	86.1	87.7	84.9	86.3	7779	88.8
2006	7968.7	997.0	94.3	88.6	92.4	87.9	91.2	86.5	8335	95.1
2007	7091.4	997.0	83.6	88.4	81.9	87.6	81.2	86.3	7532	86.0
2008	7123.6	997.0	83.3	88.1	82.0	87.4	81.3	86.1	7413	84.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					158	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	792	578		612	11	
D. Inspection, maintenance or repair without refuelling				31	26	
E. Testing of plant systems or component				21	4	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				20		
J. Grid limitation, failure or grid unavailability					2	6
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				15	5	3
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.						2
Z. Others					2	
Subtotal	792	578	0	699	209	11
Total	1370			919		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		3
15. Reactor Cooling Systems		1
16. Steam generation system		16
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		63
33. Circulating Water System		5
41. Main Generator Systems		0
42. Electrical Power Supply Systems		40
XX. Miscellaneous Systems		8
Total	0	153



# ES-10 COFRENTES

Operator: ID (IBERDROLA, S.A.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 7856.3 GW(e).h  
 Energy Availability Factor: 84.1%  
 Load Factor: 84.3%  
 Operating Factor: 87.2%  
 Energy Unavailability Factor: 15.9%  
 Total Off-line Time: 1117 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	620.1	721.8	786.0	594.2	777.3	697.0	583.3	610.6	761.4	564.9	348.3	791.3	7856.3
EAF (%)	78.7	97.4	99.4	77.5	98.2	91.0	73.7	77.1	99.4	71.3	45.5	100.0	84.1
UCF (%)	78.9	97.6	99.7	77.7	98.7	91.7	74.4	77.4	100.0	71.5	45.5	100.0	84.4
LF (%)	78.3	101.0	99.3	77.7	98.2	91.0	73.7	77.1	99.4	71.3	45.5	100.0	84.3
OF (%)	85.3	103.6	99.9	83.3	100.0	93.3	79.3	80.1	100.0	75.2	47.8	100.0	87.2
EUF (%)	21.3	2.6	0.6	22.5	1.8	9.0	26.3	22.9	0.6	28.7	54.5	0.0	15.9
PUF (%)	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.9	0.0	0.0	0.1
UCLF (%)	21.1	2.3	0.3	22.2	1.4	8.3	25.6	22.4	0.0	27.6	54.6	0.0	15.5
XUF (%)	0.1	0.2	0.3	0.2	0.5	0.7	0.7	0.2	0.6	0.2	0.0	0.0	0.3

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 09 Sep 1975      Lifetime Generation: 178435.3 GW(e).h  
 Date of First Criticality: 23 Aug 1984      Cumulative Energy Availability Factor: 86.1%  
 Date of Grid Connection: 14 Oct 1984      Cumulative Load Factor: 86.1%  
 Date of Commercial Operation: 11 Mar 1985      Cumulative Unit Capability Factor: 86.9%  
    Cumulative Energy Unavailability Factor: 13.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	5612.3	939.0	81.4	81.4	81.4	81.4	81.4	81.4	6444	87.7
1986	6668.3	939.0	82.0	81.7	81.1	81.2	81.1	81.2	7487	85.5
1987	6883.1	930.0	83.4	82.3	83.4	82.0	84.5	82.4	7615	86.9
1988	7142.2	930.0	85.7	83.2	85.5	82.9	87.4	83.7	7850	89.4
1989	7052.2	939.0	83.9	83.3	83.9	83.1	85.7	84.1	7732	88.3
1990	7070.3	939.0	85.1	83.6	85.1	83.5	86.0	84.4	7560	86.3
1991	6999.6	953.0	83.7	83.7	83.7	83.5	83.8	84.3	7660	87.4
1992	7712.1	939.0	91.9	84.7	91.9	84.6	93.5	85.5	8376	95.4
1993	7016.2	953.0	84.8	84.7	83.6	84.4	84.0	85.3	7579	86.5
1994	6990.9	953.0	85.1	84.7	83.5	84.4	83.7	85.2	7553	86.2
1995	8187.0	953.0	97.8	86.0	97.5	85.6	98.1	86.4	8683	99.1
1996	7687.5	953.0	91.9	86.5	90.9	86.0	91.8	86.8	8215	93.5
1997	6893.7	953.0	86.2	86.4	83.7	85.9	82.6	86.5	7668	87.5
1998	8174.1	993.0	96.6	87.2	96.6	86.7	94.0	87.1	8546	97.6
1999	7491.6	989.0	89.8	87.4	86.4	86.6	86.5	87.0	8004	91.4
2000	7348.1	989.0	86.9	87.4	84.6	86.5	84.6	86.9	7808	88.9
2001	8278.1	989.0	95.5	87.9	95.5	87.1	95.6	87.4	8424	96.2
2002	7918.1	1043.0	89.2	87.9	88.2	87.1	86.7	87.4	7875	89.9
2003	8002.5	1062.0	88.2	88.0	88.2	87.2	86.5	87.3	7742	88.4
2004	8813.9	1064.0	94.9	88.3	94.3	87.6	94.3	87.7	8457	96.3
2005	6765.1	1064.0	75.9	87.7	72.8	86.8	72.6	86.9	6768	77.3
2006	8872.5	1064.0	95.6	88.1	95.3	87.2	95.2	87.3	8492	96.9
2007	6008.4	1064.0	66.1	87.0	64.5	86.2	64.5	86.2	5898	67.3
2008	7856.3	1064.0	84.4	86.9	84.1	86.1	84.3	86.1	7643	87.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1141			188	
B. Refuelling without a maintenance				8	4	
C. Inspection, maintenance or repair combined with refuelling				621	2	
D. Inspection, maintenance or repair without refuelling				53		
E. Testing of plant systems or component				22		
J. Grid limitation, failure or grid unavailability						3
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					7	0
L. Human factor related					3	
P. Fire					24	
Z. Others					6	
Subtotal	0	1141	0	704	234	3
Total		1141			941	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	863	13
12. Reactor I&C Systems	120	14
13. Reactor Auxiliary System:		4
15. Reactor Cooling System:		9
17. Safety I&C Systems (excluding reactor I&C)	34	1
21. Fuel Handling and Storage Facilities		25
31. Turbine and auxiliaries	122	73
32. Feedwater and Main Steam System		5
41. Main Generator System:		31
42. Electrical Power Supply System:		8
Total	1139	183

## ES-2 SANTA MARIA DE GARONA

**Operator:** NUCLENOR (NUCLENOR, S.A.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 446.0 MW(e)  
**Design Net Capacity:** 440.0 MW(e)  
**Design Discharge Burnup:** 31000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 3841.3 GW(e).h  
**Energy Availability Factor:** 98.2%  
**Load Factor:** 98.3%  
**Operating Factor:** 99.4%  
**Energy Unavailability Factor:** 1.8%  
**Total Off-line Time:** 50 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	329.5	310.2	332.4	318.5	332.7	319.3	294.3	318.6	317.6	319.0	319.4	329.8	3841.3
<b>EAF (%)</b>	99.2	99.9	100.0	98.8	100.0	99.3	88.7	98.8	98.9	96.0	99.4	99.4	98.2
<b>UCF (%)</b>	99.2	100.0	100.0	98.8	100.0	99.3	89.1	100.0	100.0	96.1	99.4	99.4	98.4
<b>LF (%)</b>	99.3	103.5	100.2	99.3	100.3	99.4	88.7	96.0	98.9	96.0	99.5	99.4	98.3
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	92.2	97.8	100.0	100.0	100.0	100.0	99.4
<b>EUF (%)</b>	0.8	0.1	0.0	1.2	0.0	0.7	11.3	1.2	1.1	4.0	0.6	0.6	1.8
<b>PUF (%)</b>	0.6	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.2	0.2
<b>UCLF (%)</b>	0.2	0.0	0.0	0.8	0.0	0.7	10.9	0.0	0.0	3.7	0.1	0.4	1.4
<b>XUF (%)</b>	0.0	0.1	0.0	0.0	0.0	0.0	0.4	1.2	1.1	0.1	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

OPERATION AT FULL POWER IN BASE LOAD MODE. NO REFUELING OUTAGE IN THE PERIOD.

## 5. Historical Summary

**Date of Construction Start:** 02 May 1966  
**Date of First Criticality:** 05 Nov 1970  
**Date of Grid Connection:** 02 Mar 1971  
**Date of Commercial Operation:** 11 May 1971

**Lifetime Generation:** 112616.8 GW(e).h  
**Cumulative Energy Availability Factor:** 77.4%  
**Cumulative Load Factor:** 77.0%  
**Cumulative Unit Capability Factor:** 78.2%  
**Cumulative Energy Unavailability Factor:** 22.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1971	1380.3	456.0	51.0	51.0	51.0	51.0	51.0	51.0	4029	68.5
1972	2668.9	460.0	66.0	60.0	66.0	60.0	66.1	60.0	6683	76.1
1973	2351.7	440.0	72.5	64.6	72.5	64.6	61.0	60.4	6532	74.6
1974	2237.8	440.0	58.0	62.8	58.0	62.8	58.1	59.8	6456	73.7
1975	2746.8	440.0	71.3	64.6	71.3	64.6	71.3	62.2	7079	80.8
1976	2859.9	440.0	74.0	66.2	74.0	66.2	74.0	64.2	7039	80.1
1977	1815.1	440.0	47.1	63.4	47.1	63.4	47.1	61.7	4743	54.1
1978	3111.1	440.0	80.7	65.6	80.7	65.6	80.7	64.2	7409	84.6
1979	2339.4	440.0	60.6	65.1	60.6	65.1	60.7	63.8	5786	66.1
1980	780.8	440.0	19.5	60.4	19.5	60.4	20.2	59.3	1926	21.9
1981	3178.7	440.0	82.4	62.4	82.4	62.4	82.5	61.4	7597	86.7
1982	2044.1	440.0	53.3	61.6	53.3	61.6	53.0	60.7	5132	58.6
1983	2322.1	440.0	60.2	61.5	60.2	61.5	60.2	60.7	5630	64.3
1984	2873.5	440.0	85.6	63.3	74.2	62.5	74.3	61.7	6853	78.0
1985	1731.0	440.0	46.6	62.2	44.1	61.2	44.9	60.5	4285	48.9
1986	3413.6	440.0	91.8	64.0	88.6	63.0	88.6	62.3	8173	93.3
1987	2565.1	440.0	67.6	64.3	66.6	63.2	66.6	62.6	6205	70.8
1988	2693.3	440.0	70.0	64.6	70.0	63.6	69.7	63.0	6639	75.6
1989	3515.8	440.0	92.2	66.0	91.3	65.0	91.2	64.5	8324	95.0
1990	2558.6	440.0	66.4	66.1	66.4	65.1	66.4	64.6	6297	71.9
1991	3678.3	440.0	95.4	67.5	95.4	66.6	95.4	66.1	8528	97.4
1992	2377.3	440.0	69.7	67.6	69.2	66.7	61.5	65.9	6360	72.4
1993	3671.9	440.0	95.1	68.8	95.1	67.9	95.3	67.1	8444	96.4
1994	3134.1	440.0	82.0	69.3	81.2	68.5	81.3	67.7	7271	83.0
1995	3826.0	440.0	99.3	70.6	99.1	69.7	99.3	69.0	8760	100.0
1996	3203.8	440.0	83.2	71.0	82.5	70.2	82.9	69.6	7450	84.8
1997	3363.7	440.0	89.2	71.7	89.1	70.9	87.3	70.2	7853	89.7
1998	3792.5	446.0	98.0	72.7	97.5	71.9	97.1	71.2	8735	99.7
1999	3330.8	448.0	86.1	73.2	84.9	72.4	84.9	71.7	7639	87.2
2000	3854.6	446.0	98.8	74.0	98.4	73.2	98.4	72.6	8699	99.0
2001	3435.0	446.0	88.0	74.5	87.9	73.7	87.9	73.1	7737	88.3
2002	3841.4	446.0	98.8	75.3	98.3	74.5	98.3	73.9	8679	99.1
2003	3577.7	446.0	92.0	75.8	91.6	75.0	91.6	74.4	8085	92.3
2004	3873.8	446.0	98.8	76.5	98.7	75.7	98.9	75.2	8699	99.0
2005	3515.3	446.0	90.1	76.9	89.8	76.2	90.0	75.6	7946	90.7
2006	3666.8	446.0	95.8	77.4	93.7	76.7	93.9	76.1	8487	96.9
2007	3321.9	446.0	85.1	77.6	84.9	76.9	85.0	76.4	7889	90.1
2008	3841.3	446.0	98.4	78.2	98.2	77.4	98.3	77.0	8710	99.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		82			427	
B. Refuelling without a maintenance outage					12	
C. Inspection, maintenance or repair combined with refuelling	1022				6	
D. Inspection, maintenance or repair without refuelling	44				1	
E. Testing of plant systems or component	2				4	
H. Nuclear regulatory requirement	20				35	17
J. Grid limitation, failure or grid unavailability			26		2	10
K. Load-following (frequency control reserve shutdown due to reduced energy demand)	6				14	20
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. Others					3	
Subtotal	0	82	26	1094	505	50
Total		108			1649	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		29
12. Reactor I&C Systems		39
13. Reactor Auxiliary System:	82	11
14. Safety Systems		33
15. Reactor Cooling System:		181
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		20
32. Feedwater and Main Steam System		24
35. All other I&C Systems:		0
41. Main Generator System:		6
42. Electrical Power Supply System:		38
Total	82	381

# 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7744.0 GW(e).h  
**Energy Availability Factor:** 88.5%  
**Load Factor:** 87.9%  
**Operating Factor:** 89.0%  
**Energy Unavailability Factor:** 11.5%  
**Total Off-line Time:** 965 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	740.4	692.4	620.4	0.0	598.6	715.6	737.4	736.8	711.8	740.9	706.9	742.6	7744.0
<b>EAF (%)</b>	99.9	100.0	84.4	0.0	81.0	99.7	99.5	99.4	99.2	99.8	98.4	100.0	88.5
<b>UCF (%)</b>	99.9	100.0	84.4	0.0	81.0	100.0	100.0	100.0	99.4	99.8	98.4	100.0	88.7
<b>LF (%)</b>	99.2	99.2	83.1	0.0	80.2	99.1	98.8	98.7	98.6	99.2	97.9	99.5	87.9
<b>OF (%)</b>	100.0	100.0	85.9	0.0	82.4	100.0	100.0	100.0	100.0	100.0	98.8	100.0	89.0
<b>EUF (%)</b>	0.1	0.0	15.6	100.0	19.0	0.3	0.5	0.6	0.8	0.2	1.6	0.0	11.5
<b>PUF (%)</b>	0.1	0.0	13.9	100.0	18.5	0.0	0.0	0.0	0.6	0.2	0.0	0.0	11.0
<b>UCLF (%)</b>	0.0	0.0	1.7	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.6	0.2	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

UNIT OPERATED AT 100% POWER EXCEPT FOR PERIODS OF REPORTED OUTAGES.

## 5. Historical Summary

**Date of Construction Start:** 17 Aug 1979      **Lifetime Generation:** 153935.4 GW(e).h  
**Date of First Criticality:** 14 May 1988      **Cumulative Energy Availability Factor:** 86.6%  
**Date of Grid Connection:** 23 May 1988      **Cumulative Load Factor:** 86.0%  
**Date of Commercial Operation:** 06 Aug 1988      **Cumulative Unit Capability Factor:** 86.8%  
**Cumulative Energy Unavailability Factor:** 13.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	2419.5	997.0	72.7	72.7	72.7	72.7	66.3	66.3	2648	72.1
1989	7147.8	974.0	83.8	80.5	83.8	80.4	83.8	78.5	7665	87.5
1990	6372.4	974.0	74.7	78.1	74.7	78.1	74.7	76.9	7170	81.8
1991	6481.5	974.0	76.0	77.5	76.0	77.5	76.0	76.7	6891	78.7
1992	7938.5	1000.0	90.4	80.4	90.4	80.4	90.4	79.8	8028	91.4
1993	7395.9	1000.0	84.4	81.2	84.4	81.2	84.4	80.7	7512	85.8
1994	7927.7	1000.0	91.0	82.7	91.0	82.7	90.5	82.2	8009	91.4
1995	7472.6	1000.0	86.4	83.2	85.8	83.1	85.3	82.7	7597	86.7
1996	7626.3	1000.0	87.4	83.7	87.3	83.7	86.8	83.2	7713	87.8
1997	7765.5	1000.0	91.9	84.6	89.3	84.3	88.6	83.7	8066	92.1
1998	6589.7	1000.0	76.1	83.8	75.8	83.4	75.2	82.9	6686	76.3
1999	6828.8	1000.0	78.0	83.3	78.0	83.0	77.9	82.5	6876	78.5
2000	8206.5	1000.0	93.7	84.1	93.6	83.8	93.4	83.4	8251	93.9
2001	7907.4	1000.0	90.7	84.6	90.6	84.3	90.3	83.9	7966	90.9
2002	7827.0	1000.0	89.6	85.0	89.6	84.7	89.3	84.3	7876	89.9
2003	8114.7	1003.0	93.1	85.5	93.1	85.2	92.5	84.8	8210	93.7
2004	7980.1	1003.0	91.5	85.9	91.5	85.6	90.6	85.2	8121	92.4
2005	8080.6	1003.0	92.9	86.3	92.9	86.1	92.0	85.5	8175	93.3
2006	7687.8	1003.0	88.6	86.4	88.4	86.2	87.5	85.7	7788	88.9
2007	7948.9	1003.0	91.5	86.7	91.4	86.5	90.5	85.9	8039	91.8
2008	7744.0	1003.0	88.7	86.8	88.5	86.6	87.9	86.0	7820	89.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		21		3	127	
C. Inspection, maintenance or repair combined with refuelling	945			754		
D. Inspection, maintenance or repair without refuelling				0	23	
Subtotal	945	21	0	757	150	0
Total		966			907	

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		6
15. Reactor Cooling System:	7	39
16. Steam generation system:		14
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries	14	32
32. Feedwater and Main Steam System		2
41. Main Generator System:		8
42. Electrical Power Supply System:		12
XX. Miscellaneous Systems		4
Total	21	126

## ES-16 VANDELLOS-2

**Operator:** ANAV (ASOCIACION NUCLEAR ASCO-VANDELLOS A.I.E. (ENDESA/ID))

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6926.0 GW(e).h  
**Energy Availability Factor:** 75.3%  
**Load Factor:** 75.7%  
**Operating Factor:** 79.0%  
**Energy Unavailability Factor:** 24.7%  
**Total Off-line Time:** 1838 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	772.4	723.1	772.2	748.2	768.5	588.6	679.3	565.5	0.0	0.0	592.5	715.7	6926.0
<b>EAF (%)</b>	99.4	99.5	99.6	99.6	98.9	77.7	87.4	71.8	0.0	0.1	78.9	92.1	75.3
<b>UCF (%)</b>	99.9	99.8	99.8	99.9	99.7	78.7	90.3	75.1	0.0	0.1	79.9	92.7	76.2
<b>LF (%)</b>	99.3	103.0	99.3	99.6	98.8	78.2	87.4	72.7	0.0	0.0	78.8	92.1	75.7
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	83.6	89.0	75.4	0.0	0.0	98.1	100.0	79.0
<b>EUf (%)</b>	0.6	0.5	0.4	0.4	1.1	22.3	12.6	28.2	100.0	99.9	21.1	7.9	24.7
<b>PUF (%)</b>	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	7.1	7.3	1.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.1	21.2	9.6	24.8	100.0	99.9	12.9	0.0	22.4
<b>XUF (%)</b>	0.4	0.4	0.2	0.3	0.8	1.0	2.9	3.3	0.0	0.0	1.0	0.6	0.9

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

ON 19/06/08 AN UNPLANNED AUTOMATIC SCRAM OCCURRED DUE TO AN OVERPRESSURE IN THE REGULATOR TO MAIN TRANSFORMER (TP2), WITH A DURATION OF AROUND 4 DAYS. ON 24/08/2008 AT 08:49 HOURS, WHILE THE PLANT WAS AT 100% NOMINAL POWER, A NON-PROGRAMMED AUTOMATIC SHUTDOWN OF THE REACTOR OCCURRED DUE TO A TURBINE TRIP, THE PLANT BEING AT ABOVE 34% POWER. THE SHUTDOWN OF THE TURBINE OCCURRED BECAUSE OF THE ACTUATION OF THE MAIN TRANSFORMER DIFFERENTIAL PROTECTION CAUSED BY A GROUND FAULT IN THE 21 KV "S" PHASE OF THE MAIN GENERATOR OUTPUT TO THE MAIN TRANSFORMER. EIGHT SECONDS AFTER THE SHUTDOWN SIGNAL, THE FIRE PREVENTION SYSTEM WAS ACTIVATED WHEN A FIRE WAS DETECTED IN THE AREA OF THE MAIN ELECTRIC GENERATOR. THIS MEANT THE DECLARATION OF EMERGENCY PRE-ALERT DUE TO EVENT 1.3.1. "FIRE OF DURATION EXCEEDING 10 MINUTES SINCE CONFIRMATION, WHICH DOES NOT AFFECT SAFETY SYSTEMS". THE FIRE STARTED IN THE LEAD CONDUIT BOX OF THE MAIN GENERATOR NEUTRAL CAUSING DAMAGE TO THE PANEL SHELL WHICH CONTAINS THE STAR CONNECTION AND THE NEUTRAL GROUNDING DEVICE OF THIS EQUIPMENT, ALSO TO THE HYDROGEN SUPPLY SYSTEM TO THE MAIN GENERATOR AND TO THE INSULATION OF THE ADJACENT ISOPHASE BUSES. AT 10:00 HOURS, THE FIRE WAS COMPLETELY EXTINGUISHED AND THE END OF THE PRE-ALERT WAS DECLARED AT 10:30 HOURS. THE PLANT WAS STOPPED 53 DAYS. ON OCTOBER THE PLANT WAS STOPPED 6 DAYS TO COMPLETE A PROGRAMME OF SPECIAL TEST IN THE ALTERNATOR. THE NEAR OUTAGE STOP FOR REFUELING IS FORESEEN FOR MARCH, 2009.



## 5. Historical Summary

<b>Date of Construction Start:</b>	29 Dec 1980	<b>Lifetime Generation:</b>	149887.8 GW(e).h
<b>Date of First Criticality:</b>	14 Nov 1987	<b>Cumulative Energy Availability Factor:</b>	82.3%
<b>Date of Grid Connection:</b>	12 Dec 1987	<b>Cumulative Load Factor:</b>	82.3%
<b>Date of Commercial Operation:</b>	08 Mar 1988	<b>Cumulative Unit Capability Factor:</b>	83.1%
		<b>Cumulative Energy Unavailability Factor:</b>	17.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	4610.9	930.0	68.3	68.3	67.4	67.4	67.5	67.5	5180	70.5
1989	5868.8	943.0	70.6	69.6	70.6	69.1	71.0	69.4	6357	72.6
1990	7334.3	943.0	87.8	76.0	87.8	75.7	88.8	76.3	7925	90.5
1991	7214.9	953.0	88.5	79.3	86.3	78.5	86.4	79.0	7825	89.3
1992	6718.2	953.0	79.6	79.4	79.6	78.7	80.3	79.2	7249	82.5
1993	6910.4	961.0	84.3	80.2	82.4	79.4	82.1	79.7	7377	84.2
1994	7208.4	961.0	85.6	81.0	85.6	80.3	85.6	80.6	7676	87.6
1995	7571.3	961.0	89.5	82.1	89.5	81.5	89.9	81.8	7957	90.8
1996	7511.4	961.0	89.1	82.9	89.0	82.3	89.0	82.6	7942	90.4
1997	7243.1	961.0	88.7	83.5	85.5	82.7	86.0	83.0	7961	90.9
1998	8359.0	966.0	99.3	85.0	99.0	84.2	98.8	84.4	8760	100.0
1999	7224.4	1024.0	83.4	84.8	82.5	84.0	80.5	84.1	7430	84.8
2000	7976.9	1043.0	87.9	85.1	87.6	84.3	87.1	84.3	7852	89.4
2001	9010.3	1043.0	99.4	86.2	99.4	85.5	98.6	85.4	8727	99.6
2002	8010.1	1040.0	89.2	86.4	88.1	85.7	87.9	85.6	7881	90.0
2003	8219.3	1040.0	90.9	86.7	89.5	86.0	90.2	85.9	8067	92.1
2004	8677.0	1045.0	95.8	87.3	94.5	86.5	94.5	86.5	8429	96.0
2005	4698.4	1045.0	51.7	85.2	51.3	84.4	51.3	84.4	4657	53.2
2006	7022.7	1045.0	78.0	84.8	76.2	83.9	76.7	84.0	6882	78.6
2007	5387.8	1045.0	59.4	83.4	59.1	82.6	58.9	82.6	5313	60.7
2008	6926.0	1045.0	76.2	83.1	75.3	82.3	75.7	82.3	6922	79.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1863			384	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling				578	1	
D. Inspection, maintenance or repair without refuelling				60	3	
E. Testing of plant systems or component				5	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling					86	
J. Grid limitation, failure or grid unavailability					4	12
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						6
Subtotal	0	1863	0	643	488	18
Total		1863			1149	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems	84	53
13. Reactor Auxiliary Systems		150
15. Reactor Cooling Systems		31
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		9
33. Circulating Water System		4
41. Main Generator System	1660	10
42. Electrical Power Supply System	118	87
XX. Miscellaneous Systems		4
Total	1862	379

## SE-9 FORSMARK-1

**Operator:** FKA (FORSMARK KRAFTGRUPP AB)  
**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 987.0 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 2008

**Net Energy Production:** 6973.7 GW(e).h  
**Energy Availability Factor:** 80.7%  
**Load Factor:** 81.3%  
**Operating Factor:** 85.0%  
**Energy Unavailability Factor:** 19.3%  
**Total Off-line Time:** 1318 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	678.1	685.1	730.4	703.5	245.2	0.0	497.5	649.2	689.6	717.9	698.8	678.4	6973.7
<b>EAF (%)</b>	91.7	99.5	99.5	99.5	33.7	0.0	68.4	89.2	97.9	98.4	98.9	92.6	80.7
<b>UCF (%)</b>	91.7	99.6	99.5	99.5	33.8	0.0	71.0	91.9	99.8	99.0	98.9	92.6	81.4
<b>LF (%)</b>	92.3	103.3	100.4	100.0	33.7	0.0	68.4	89.2	97.9	98.5	99.2	93.2	81.3
<b>OF (%)</b>	100.0	103.6	100.0	100.1	34.4	0.0	82.0	100.0	100.0	99.9	100.0	100.0	85.0
<b>EUF (%)</b>	8.3	0.5	0.5	0.5	66.3	100.0	31.6	10.8	2.1	1.6	1.1	7.4	19.3
<b>PUF (%)</b>	0.4	0.0	0.0	0.0	66.1	95.0	6.9	0.0	0.0	1.0	0.0	0.0	14.1
<b>UCLF (%)</b>	7.9	0.5	0.6	0.5	0.1	5.1	22.2	8.1	0.2	0.0	1.1	7.4	4.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.1	0.0	2.6	2.7	1.9	0.5	0.0	0.0	0.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THE POWER CHANGES VALID FROM FIRST OF MARCH 2008 ORIGINATE FROM REPLACEMENT OF STEAM TURBINES AND INSTALLATION OF NEW TESTING DEVICE FOR MEASUREMENT OF ENERGY GENERATED AND ARE CALCULATED ON A AVERAGE COOLING WATER TEMPERATURE OF 8 DEGREE CELSIUS. ENERGY AVAILABILITY FACTOR (EAF) ACHIEVED 81,4 %LOSS OF PRODUCTION DUE TO REVISION 1352 GWH, LOSS OF PRODUCTION DUE FAULT/ERROR IN THE PLANT 237 GWH. CONNECTED TIME TO THE GRID 7443 H

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jun 1973	<b>Lifetime Generation:</b>	190339.0 GW(e).h
<b>Date of First Criticality:</b>	23 Apr 1980	<b>Cumulative Energy Availability Factor:</b>	83.6%
<b>Date of Grid Connection:</b>	06 Jun 1980	<b>Cumulative Load Factor:</b>	80.8%
<b>Date of Commercial Operation:</b>	10 Dec 1980	<b>Cumulative Unit Capability Factor:</b>	85.8%
		<b>Cumulative Energy Unavailability Factor:</b>	16.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	669.6	928.0	100.0	100.0	100.0	100.0	100.0	100.0	744	100.0
1981	6063.7	900.0	76.9	78.7	76.9	78.7	76.9	78.7	7305	83.4
1982	5548.1	900.0	70.4	74.7	70.4	74.7	70.4	74.7	7131	81.4
1983	5926.0	900.0	75.2	74.9	75.2	74.9	75.2	74.9	8095	92.4
1984	6461.8	900.0	91.9	79.0	91.9	79.0	81.7	76.5	8207	93.4
1985	5587.6	900.0	79.4	79.1	79.4	79.1	70.9	75.4	7773	88.7
1986	7317.2	954.0	89.8	81.0	89.8	81.0	87.5	77.5	8303	94.8
1987	6493.4	970.0	79.5	80.7	79.5	80.7	76.4	77.4	8291	94.6
1988	6852.8	970.0	81.8	80.9	81.8	80.9	80.4	77.8	7739	88.1
1989	6138.6	969.0	85.5	81.4	85.5	81.4	72.3	77.1	7907	90.3
1990	6257.5	967.0	85.8	81.9	85.8	81.9	73.9	76.8	7885	90.0
1991	7486.6	968.0	90.6	82.7	88.3	82.5	88.3	77.9	8122	92.7
1992	6833.6	968.0	85.2	82.9	80.3	82.3	80.4	78.1	8174	93.1
1993	7022.8	968.0	91.9	83.6	82.7	82.3	82.8	78.5	8009	91.4
1994	7393.4	968.0	91.4	84.2	87.0	82.6	87.2	79.1	8109	92.6
1995	7325.2	968.0	91.3	84.6	86.2	82.9	86.4	79.6	8173	93.3
1996	7311.4	968.0	95.3	85.3	86.4	83.1	86.0	80.0	8412	95.8
1997	5403.0	968.0	64.6	84.1	64.6	82.0	63.5	79.0	6255	71.2
1998	7307.0	968.0	93.6	84.6	93.6	82.7	86.2	79.4	8265	94.3
1999	7583.0	968.0	96.7	85.3	96.3	83.4	89.4	79.9	8420	96.1
2000	5731.0	968.0	86.0	85.3	80.2	83.2	67.4	79.3	7203	82.0
2001	7286.0	968.0	94.8	85.8	86.3	83.4	85.9	79.6	8482	96.8
2002	7143.0	961.0	90.0	86.0	86.0	83.5	84.9	79.9	7978	91.1
2003	7456.0	961.0	88.5	86.1	88.5	83.7	88.6	80.2	8093	92.4
2004	8029.0	961.0	97.5	86.5	95.6	84.2	95.1	80.9	8555	97.4
2005	7337.4	961.0	85.6	86.5	84.6	84.2	84.6	81.0	7648	87.3
2006	6683.9	1016.0	76.6	86.1	75.6	83.9	75.1	80.8	6806	77.7
2007	6937.8	987.0	81.1	85.9	80.4	83.7	80.2	80.8	7204	82.2
2008	6973.7	978.0	81.4	85.8	80.7	83.6	81.3	80.8	7442	85.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		170			153	
B. Refuelling without a maintenance outage					2	
C. Inspection, maintenance or repair combined with refuelling	1172			579		
D. Inspection, maintenance or repair without refuelling				23		
E. Testing of plant systems or component				4		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				35		
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						15
L. Human factor related					36	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)					4	
Subtotal	1172	170	0	641	195	17
Total		1342			853	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	170	12
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		6
15. Reactor Cooling Systems		12
17. Safety I&C Systems (excluding reactor I&C)		3
21. Fuel Handling and Storage Facilities		29
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		3
41. Main Generator Systems		5
42. Electrical Power Supply Systems		59
XX. Miscellaneous Systems		1
Total	170	150

## SE-11 FORSMARK-2

**Operator:** FKA (FORSMARK KRAFTGRUPP AB)  
**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1000.0 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 2008

**Net Energy Production:** 6920.1 GW(e).h  
**Energy Availability Factor:** 79.1%  
**Load Factor:** 79.7%  
**Operating Factor:** 83.8%  
**Energy Unavailability Factor:** 20.9%  
**Total Off-line Time:** 1418 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	740.9	649.1	709.6	713.3	726.2	283.7	472.2	351.3	192.1	687.8	674.8	719.2	6920.1
<b>EAF (%)</b>	98.9	92.4	95.7	99.7	98.6	39.8	64.1	47.7	27.0	93.4	94.3	97.0	79.1
<b>UCF (%)</b>	98.9	92.4	95.7	99.7	99.1	40.6	66.5	49.1	27.4	93.9	94.3	97.0	79.6
<b>LF (%)</b>	99.6	96.6	96.3	100.2	98.6	39.8	64.1	47.7	27.0	93.3	94.7	97.6	79.7
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	42.2	73.9	53.8	32.2	99.9	100.0	100.0	83.8
<b>EUF (%)</b>	1.1	7.6	4.3	0.3	1.4	60.2	35.9	52.3	73.0	6.6	5.7	3.0	20.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.2	0.0	2.1	47.2	71.1	0.0	0.0	0.1	10.0
<b>UCLF (%)</b>	1.1	7.6	4.3	0.3	0.7	59.4	31.4	3.7	1.5	6.1	5.7	2.8	10.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.5	0.8	2.4	1.4	0.4	0.5	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THE POWER CHANGES VALID FROM FIRST OF MARCH 2008 ORIGINATE FROM REPLACEMENT OF STEAM TURBINES AND INSTALLATION OF NEW TESTING DEVICE FOR MEASUREMENT OF ENERGY GENERATED AND ARE CALCULATED ON AN AVERAGE COOLING WATER TEMPERATURE OF 8 DEGREE CELSIUS. DURING 2008 THE ENERGY AVAILABILITY FACTOR (EAF) ACHIEVED 79,7 % LOSS OF PRODUCTION DUE TO REVISION 854 GWHLOSS OF PRODUCTION DUE TO FAULT/ERROR IN THE PLANT 912 GWHCONNECTED TIME TO THE GRID 7342 H

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jan 1975	<b>Lifetime Generation:</b>	185866.0 GW(e).h
<b>Date of First Criticality:</b>	16 Nov 1980	<b>Cumulative Energy Availability Factor:</b>	84.0%
<b>Date of Grid Connection:</b>	26 Jan 1981	<b>Cumulative Load Factor:</b>	80.8%
<b>Date of Commercial Operation:</b>	07 Jul 1981	<b>Cumulative Unit Capability Factor:</b>	86.0%
		<b>Cumulative Energy Unavailability Factor:</b>	16.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	2870.7	900.0	72.2	72.2	72.2	72.2	72.2	72.2	3977	90.1
1982	5316.4	900.0	67.4	69.0	67.4	69.0	67.4	69.0	6076	69.4
1983	5484.4	900.0	69.6	69.2	69.6	69.2	69.6	69.2	7879	89.9
1984	5911.7	900.0	82.6	73.1	82.6	73.0	74.8	70.8	7442	84.7
1985	5735.4	900.0	83.8	75.4	83.8	75.4	72.7	71.3	8048	91.9
1986	6987.9	938.0	86.5	77.5	86.5	77.5	85.0	73.8	8231	94.0
1987	6553.8	949.0	85.5	78.8	85.5	78.8	78.8	74.6	8190	93.5
1988	6976.2	963.0	83.2	79.4	83.2	79.4	82.5	75.7	8032	91.4
1989	5943.4	964.0	90.0	80.7	90.0	80.7	70.4	75.1	8222	93.9
1990	6426.2	970.0	88.6	81.6	88.6	81.6	75.6	75.1	8119	92.7
1991	7155.2	969.0	85.8	82.0	84.2	81.8	84.3	76.0	8083	92.3
1992	6748.9	969.0	86.2	82.4	79.2	81.6	79.3	76.3	8293	94.4
1993	6715.5	969.0	88.8	82.9	79.1	81.4	79.2	76.6	7683	87.8
1994	7679.5	969.0	92.5	83.6	90.4	82.1	90.5	77.6	8194	93.6
1995	7149.2	969.0	91.6	84.2	84.1	82.2	84.2	78.1	8143	93.0
1996	7348.2	969.0	91.2	84.7	86.2	82.5	86.3	78.6	8134	92.6
1997	7325.0	969.0	87.4	84.8	87.4	82.8	86.1	79.1	7927	90.2
1998	7199.0	969.0	92.1	85.3	91.9	83.3	84.8	79.4	8240	94.1
1999	7292.0	968.0	91.8	85.6	91.8	83.8	86.0	79.8	8117	92.7
2000	5429.0	964.0	80.8	85.4	76.7	83.4	64.1	79.0	6946	79.1
2001	7400.0	964.0	92.3	85.7	88.8	83.7	87.6	79.4	8321	95.0
2002	6824.0	964.0	89.9	85.9	82.2	83.6	80.8	79.5	8155	93.1
2003	7303.9	959.0	87.1	86.0	87.1	83.8	86.9	79.8	7916	90.4
2004	7978.7	954.0	96.9	86.4	95.2	84.3	95.2	80.5	8529	97.1
2005	7815.5	951.0	94.6	86.8	93.7	84.7	93.7	81.0	8348	95.3
2006	6011.9	951.0	73.3	86.2	72.7	84.2	71.5	80.6	6426	73.4
2007	7470.1	1000.0	85.7	86.2	85.0	84.2	85.3	80.8	7750	88.5
2008	6920.1	990.0	79.6	86.0	79.1	84.0	79.7	80.8	7342	83.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		610			170	
B. Refuelling without a maintenance outage					2	
C. Inspection, maintenance or repair combined with refuelling				543		
D. Inspection, maintenance or repair without refuelling	832			50		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				9		
H. Nuclear regulatory requirement					28	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						18
L. Human factor related					16	
P. Fire					4	
Subtotal	832	610	0	602	220	18
Total		1442			840	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		2
14. Safety Systems		17
15. Reactor Cooling Systems		12
21. Fuel Handling and Storage Facilities		74
31. Turbine and auxiliaries		24
32. Feedwater and Main Steam System		7
42. Electrical Power Supply System	610	9
Total	610	146

# SE-14 FORSMARK-3

Operator: FKA (FORSMARK KRAFTGRUPP AB)

Contractor: ABBATOM (ABBATOM (formerly ASEA-ATOM))

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1170.0 MW(e)  
 Design Net Capacity: 1050.0 MW(e)  
 Design Discharge Burnup: 42000 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 7109.8 GW(e).h  
 Energy Availability Factor: 68.8%  
 Load Factor: 69.4%  
 Operating Factor: 70.6%  
 Energy Unavailability Factor: 31.2%  
 Total Off-line Time: 2575 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	879.1	823.7	878.6	846.4	862.4	654.9	327.5	451.8	813.6	571.7	0.0	0.0	7109.8
EAF (%)	99.8	100.0	100.0	99.8	99.1	77.7	37.6	51.9	96.6	65.6	0.0	0.0	68.8
UCF (%)	99.8	100.0	100.0	99.8	100.0	80.0	39.6	53.9	99.1	66.3	0.0	0.0	69.6
LF (%)	101.0	104.8	100.9	100.6	99.1	77.7	37.6	51.9	96.6	65.6	0.0	0.0	69.4
OF (%)	100.0	103.6	100.0	100.1	100.0	84.3	39.9	55.8	100.0	66.8	0.0	0.0	70.6
EUf (%)	0.2	0.0	0.0	0.2	0.9	22.3	62.4	48.1	3.4	34.4	100.0	100.0	31.2
PUF (%)	0.1	0.0	0.0	0.2	0.0	0.0	60.4	46.1	0.0	7.8	0.0	0.0	9.7
UCLF (%)	0.1	0.0	0.0	0.0	0.0	20.0	0.0	0.0	1.0	25.9	100.0	100.0	20.6
XUF (%)	0.0	0.0	0.0	0.0	0.9	2.2	2.0	2.0	2.5	0.8	0.0	0.0	0.9

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

DURING 2008 THE ENERGY AVAILABILITY FACTOR (EAF) ACHIEVED 69,7 % LOSS OF PRODUCTION DUE TO REVISION 925 GWHLOSS OF PRODUCTION DUE TO FAULT/ERROR IN THE PLANT 2183 GWHCONNECTED TIME TO THE GRID 6186 H

## 5. Historical Summary

Date of Construction Start: 01 Jan 1979      Lifetime Generation: 199898.0 GW(e).h  
 Date of First Criticality: 28 Oct 1984      Cumulative Energy Availability Factor: 86.9%  
 Date of Grid Connection: 05 Mar 1985      Cumulative Load Factor: 84.5%  
 Date of Commercial Operation: 18 Aug 1985      Cumulative Unit Capability Factor: 89.2%  
    Cumulative Energy Unavailability Factor: 13.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	3296.6	1068.0	93.8	93.8	93.8	93.8	85.5	85.5	3509	95.5
1986	8069.6	1060.0	88.4	90.0	88.4	90.0	86.9	86.5	7983	91.1
1987	7038.9	1063.0	77.9	84.9	77.9	84.9	75.6	82.0	7866	89.8
1988	7462.9	1068.0	80.4	83.6	80.4	83.6	79.6	81.3	7807	88.9
1989	7367.2	1118.0	85.8	84.1	85.8	84.1	75.2	79.8	7792	88.9
1990	7942.1	1150.0	90.6	85.4	90.6	85.4	78.8	79.6	8165	93.2
1991	8665.1	1155.0	87.5	85.7	85.6	85.4	85.6	80.6	8324	95.0
1992	8176.2	1197.0	89.4	86.3	81.2	84.8	77.8	80.2	7954	90.6
1993	8457.9	1158.0	93.2	87.1	83.4	84.6	83.4	80.6	8244	94.2
1994	9228.8	1158.0	93.4	87.8	90.9	85.3	91.1	81.7	8277	94.6
1995	8945.9	1158.0	92.8	88.3	88.2	85.6	88.2	82.4	8250	94.2
1996	8819.2	1158.0	89.1	88.4	86.7	85.7	86.7	82.8	8008	91.2
1997	8955.0	1158.0	89.9	88.5	89.9	86.0	88.0	83.2	8004	91.1
1998	8961.0	1158.0	93.9	88.9	93.8	86.6	88.3	83.6	8227	93.9
1999	8825.0	1157.0	91.1	89.1	91.0	86.9	87.1	83.8	8005	91.4
2000	7934.0	1157.0	94.9	89.5	87.7	87.0	78.1	83.5	8038	91.5
2001	8182.0	1155.0	86.2	89.3	81.8	86.7	80.9	83.3	7585	86.6
2002	9079.0	1158.0	95.0	89.6	91.2	86.9	89.5	83.7	8450	96.5
2003	9100.3	1155.0	89.9	89.6	89.9	87.1	89.9	84.0	8507	97.1
2004	8970.4	1155.0	89.4	89.6	87.7	87.1	87.6	84.2	7886	89.8
2005	9858.9	1190.0	96.2	89.9	94.6	87.5	94.6	84.7	8491	96.9
2006	9600.5	1190.0	94.6	90.2	92.4	87.7	92.1	85.1	8323	95.0
2007	8992.6	1170.0	88.2	90.1	87.3	87.7	87.7	85.2	7770	88.7
2008	7109.8	1170.0	69.6	89.2	68.8	86.9	69.4	84.5	6185	70.6



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		1751			52	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	776			534		
D. Inspection, maintenance or repair without refuelling				12		
E. Testing of plant systems or component	72			11		
F. Major back-fitting, refurbishment or upgrading activities with refuelling						
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						9
Subtotal	848	1751	0	557	53	9
Total		2599			619	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems	1638	8
13. Reactor Auxiliary System:	113	
15. Reactor Cooling System:		10
21. Fuel Handling and Storage Facilities		5
31. Turbine and auxiliaries		9
41. Main Generator System:		0
42. Electrical Power Supply System:		11
Total	1751	50

## SE-2 OSKARSHAMN-1

**Operator:** OKG (OKG AKTIEBOLAG)

**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 467.0 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 2008

**Net Energy Production:** 3496.4 GW(e).h  
**Energy Availability Factor:** 85.5%  
**Load Factor:** 84.9%  
**Operating Factor:** 86.6%  
**Energy Unavailability Factor:** 14.5%  
**Total Off-line Time:** 1177 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	339.1	327.8	311.0	338.2	304.5	160.6	70.5	338.1	330.2	299.2	334.3	342.9	3496.4
<b>EAF (%)</b>	96.8	100.0	89.3	100.0	96.8	48.1	20.0	96.0	96.9	85.9	99.3	98.8	85.5
<b>UCF (%)</b>	96.8	100.0	89.3	100.0	97.6	71.7	21.1	99.8	99.9	86.9	99.9	99.1	88.3
<b>LF (%)</b>	97.6	104.5	89.5	100.7	87.6	47.8	20.0	96.1	97.0	84.9	98.2	97.4	84.9
<b>OF (%)</b>	96.8	103.6	89.9	100.1	89.1	51.0	22.2	100.0	100.0	87.9	100.0	100.0	86.6
<b>EUF (%)</b>	3.2	0.0	10.7	0.0	3.2	51.9	80.0	4.0	3.1	14.1	0.7	1.2	14.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	28.3	59.0	0.0	0.1	0.0	0.1	0.2	7.4
<b>UCLF (%)</b>	3.2	0.0	10.7	0.0	2.5	0.0	19.9	0.2	0.0	13.1	0.1	0.7	4.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.8	23.7	1.1	3.8	3.0	1.0	0.6	0.3	2.8

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

AN UPDATE REGARDING RUP WAS IMPLEMENTED IN JULY FOR ALL UNITS. FOR UNIT ONE IT MEANS AN UPRATE TO 473 MWE (NET). 16TH OF JUNE THE SWICHYARD FOR UNIT 1 WAS HIT BY A LIGHTNING STROKE. THE UNIT WAS FORCED DOWN UNTIL THE 22ND WHEN THE PLANNED ANNUAL OUTAGE WITH REFUELLING WAS SCHEDULED TO START. THE OUTAGE WAS EXTENDED 96H DUE TO NDT WORKS PERFORMED ON THE CORE SHROUD AND TURBINE WORKS.

## 5. Historical Summary

**Date of Construction Start:** 01 Aug 1966  
**Date of First Criticality:** 12 Dec 1970  
**Date of Grid Connection:** 19 Aug 1971  
**Date of Commercial Operation:** 06 Feb 1972

**Lifetime Generation:** 90092.6 GW(e).h  
**Cumulative Energy Availability Factor:** 63.0%  
**Cumulative Load Factor:** 62.1%  
**Cumulative Unit Capability Factor:** 63.3%  
**Cumulative Energy Unavailability Factor:** 37.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	1253.4	440.0	35.2	35.2	35.2	35.2	35.4	35.4	3318	41.3
1973	1967.9	440.0	49.9	42.9	49.9	42.9	51.1	43.6	4871	55.6
1974	1283.9	440.0	33.4	39.6	33.4	39.6	33.3	40.1	3067	35.0
1975	2435.3	440.0	69.5	47.3	69.5	47.3	63.2	46.0	6483	74.0
1976	2469.5	440.0	62.1	50.3	62.1	50.3	63.9	49.6	6278	71.5
1977	2677.1	440.0	69.5	53.5	69.5	53.5	69.5	53.0	6540	74.7
1978	3113.8	440.0	80.3	57.4	80.3	57.4	80.8	57.0	7390	84.4
1979	2716.4	440.0	70.0	59.0	70.0	59.0	70.5	58.7	6422	73.3
1980	2994.0	440.0	77.4	61.0	77.4	61.0	77.5	60.8	7221	82.2
1981	2885.8	440.0	74.9	62.4	74.9	62.4	74.9	62.2	7094	81.0
1982	2937.7	440.0	76.2	63.7	76.2	63.7	76.2	63.5	6967	79.5
1983	3133.3	440.0	81.3	65.2	81.3	65.2	81.3	65.0	7694	87.8
1984	2959.7	440.0	81.1	66.4	81.1	66.4	76.6	65.9	7249	82.5
1985	2753.2	440.0	73.4	66.9	71.8	66.8	71.4	66.3	6490	74.1
1986	3134.4	440.0	81.9	67.9	81.9	67.8	81.3	67.3	7359	84.0
1987	3232.5	440.0	86.6	69.1	86.6	69.0	83.9	68.3	7809	89.1
1988	2863.1	442.0	73.6	69.4	73.6	69.3	73.7	68.7	6827	77.7
1989	3175.6	442.0	87.0	70.3	87.0	70.3	82.0	69.4	7788	88.9
1990	2493.8	442.0	64.1	70.0	64.1	69.9	64.4	69.1	5794	66.1
1991	3349.2	442.0	86.1	70.8	86.1	70.7	86.5	70.0	7856	89.7
1992	1784.8	442.0	45.9	69.6	45.9	69.5	46.0	68.9	4362	49.7
1993	0.0	445.0	0.0	66.4	0.0	66.3	0.0	65.7	0	0.0
1994	0.0	445.0	0.0	63.5	0.0	63.4	0.0	62.8	0	0.0
1995	0.0	445.0	0.0	60.8	0.0	60.8	0.0	60.1	0	0.0
1996	2380.0	442.0	61.1	60.8	61.1	60.8	61.3	60.2	5564	63.3
1997	2925.9	442.0	75.8	61.4	75.8	61.3	75.6	60.8	6716	76.7
1998	1297.7	445.0	32.6	60.3	32.6	60.3	33.3	59.8	2968	33.9
1999	3298.9	445.0	86.7	61.3	86.7	61.2	84.6	60.7	7647	87.3
2000	3060.2	445.0	88.8	62.2	88.8	62.2	78.3	61.3	7765	88.4
2001	3080.9	445.0	83.7	63.0	83.7	62.9	79.0	61.9	7462	85.2
2002	0.0	445.0	0.0	60.9	0.0	60.9	0.0	59.9	0	0.0
2003	3058.4	467.0	75.9	61.4	74.8	61.3	74.5	60.3	7075	80.8
2004	3536.5	467.0	87.9	62.3	85.8	62.1	86.2	61.2	7743	88.1
2005	3265.9	467.0	80.0	62.8	79.5	62.6	79.8	61.7	7129	81.4
2006	2088.4	467.0	51.3	62.5	50.9	62.3	51.0	61.4	4520	51.6
2007	2575.1	467.0	64.1	62.5	63.2	62.3	62.9	61.5	5703	65.1
2008	3496.4	473.0	88.3	63.3	85.5	63.0	84.9	62.1	7583	86.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		178		2	697	
B. Refuelling without a maintenance outage					4	
C. Inspection, maintenance or repair combined with refuelling	634	96		783	65	
D. Inspection, maintenance or repair without refuelling				682		
E. Testing of plant systems or component				2	3	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				225	8	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				12		
H. Nuclear regulatory requirement					306	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					111	
L. Human factor related		74			6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			149			
U. Security and access control and other preventive shutdown due to external threats			62			
Z. Others					10	
Subtotal	634	348	211	1706	1210	1
Total		1193			2917	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		121
12. Reactor I&C Systems	1	96
13. Reactor Auxiliary Systems		14
14. Safety Systems	89	26
15. Reactor Cooling Systems		27
21. Fuel Handling and Storage Facilities		19
31. Turbine and auxiliaries	3	265
32. Feedwater and Main Steam System	84	25
33. Circulating Water System		0
35. All other I&C Systems		4
41. Main Generator Systems		71
42. Electrical Power Supply Systems		24
XX. Miscellaneous Systems		2
Total	177	694

## SE-3 OSKARSHAMN-2

**Operator:** OKG (OKG AKTIEBOLAG)

**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 598.0 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 2008

**Net Energy Production:** 4504.2 GW(e).h  
**Energy Availability Factor:** 86.6%  
**Load Factor:** 86.3%  
**Operating Factor:** 89.6%  
**Energy Unavailability Factor:** 13.4%  
**Total Off-line Time:** 914 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	437.3	406.6	364.1	419.4	130.5	252.9	421.1	398.9	405.8	425.6	415.2	426.8	4504.2
<b>EAF (%)</b>	98.0	97.8	81.7	97.1	29.3	58.6	96.1	90.9	95.6	98.1	99.0	98.7	86.6
<b>UCF (%)</b>	99.7	99.5	83.4	99.5	30.4	60.5	99.8	95.2	99.3	99.7	99.8	99.2	88.7
<b>LF (%)</b>	98.3	97.7	81.8	97.4	29.3	58.7	95.9	90.9	95.5	96.8	97.7	97.2	86.3
<b>OF (%)</b>	100.0	100.0	84.8	100.0	32.4	62.5	100.0	96.2	100.0	100.0	100.0	100.0	89.6
<b>EUF (%)</b>	2.0	2.2	18.3	2.9	70.7	41.4	3.9	9.1	4.4	1.9	1.0	1.3	13.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	69.5	13.1	0.0	0.0	0.3	0.0	0.0	0.6	7.1
<b>UCLF (%)</b>	0.3	0.5	16.6	0.5	0.1	26.4	0.2	4.8	0.4	0.3	0.2	0.2	4.2
<b>XUF (%)</b>	1.7	1.7	1.7	2.4	1.1	1.9	3.7	4.3	3.7	1.6	0.8	0.5	2.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

PLANNED OUTAGE WITH REFUELLING WAS STARTED 9TH OF MAY AND WAS COMPLETED 14TH OF JUNE. THE OUTAGE EXTENTION ENDED UP TO 188 H. AN UPDATE REGARDING RUP WAS IMPLEMENTED IN JULY FOR ALL UNITS. FOR UNIT TWO IT MEANS A DOWNRATE TO 590 MWE (NET).

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Sep 1969	<b>Lifetime Generation:</b>	135099.1 GW(e).h
<b>Date of First Criticality:</b>	06 Mar 1974	<b>Cumulative Energy Availability Factor:</b>	79.2%
<b>Date of Grid Connection:</b>	02 Oct 1974	<b>Cumulative Load Factor:</b>	76.0%
<b>Date of Commercial Operation:</b>	01 Jan 1975	<b>Cumulative Unit Capability Factor:</b>	79.8%
		<b>Cumulative Energy Unavailability Factor:</b>	20.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	3010.6	580.0	64.5	64.5	64.5	64.5	59.3	59.3	5694	65.0
1976	2893.0	570.0	63.8	64.1	63.8	64.1	57.8	58.5	5744	65.4
1977	3160.9	590.0	65.0	64.4	65.0	64.4	61.2	59.4	6372	72.7
1978	3638.3	570.0	72.9	66.5	72.9	66.5	72.9	62.7	6695	76.4
1979	3789.2	570.0	74.5	68.1	74.5	68.1	75.9	65.3	7473	85.3
1980	4172.3	570.0	86.1	71.1	86.1	71.1	83.3	68.3	7699	87.6
1981	3836.5	570.0	76.7	71.9	76.7	71.9	76.8	69.5	7432	84.8
1982	4248.7	570.0	85.3	73.6	85.3	73.6	85.1	71.5	7905	90.2
1983	4054.3	595.0	86.9	75.1	86.9	75.1	77.8	72.2	7703	87.9
1984	4797.6	595.0	92.2	76.8	92.2	76.8	91.8	74.2	8253	94.0
1985	3932.3	590.0	87.2	77.8	87.2	77.8	76.1	74.4	7739	88.3
1986	4277.8	595.0	83.9	78.3	83.9	78.3	82.1	75.0	7770	88.7
1987	4230.8	595.0	83.5	78.7	83.5	78.7	81.2	75.5	7789	88.9
1988	4417.4	605.0	85.9	79.3	85.9	79.3	83.1	76.1	7894	89.9
1989	3960.7	605.0	88.3	79.9	88.3	79.9	74.7	76.0	8065	92.1
1990	4050.3	605.0	84.1	80.2	84.1	80.2	76.4	76.0	7885	90.0
1991	4103.4	605.0	79.4	80.1	79.4	80.1	77.4	76.1	7467	85.2
1992	2851.5	605.0	55.3	78.7	55.3	78.7	53.7	74.8	5310	60.5
1993	2611.5	605.0	55.3	77.4	51.0	77.2	49.3	73.4	4924	56.2
1994	4460.8	605.0	88.6	78.0	86.8	77.7	84.2	74.0	7833	89.4
1995	4175.8	605.0	83.6	78.3	79.4	77.8	78.8	74.2	7452	85.1
1996	3760.4	605.0	73.1	78.0	71.7	77.5	70.8	74.1	6543	74.5
1997	4417.4	605.0	86.4	78.4	85.4	77.8	83.4	74.5	7707	88.0
1998	4457.8	605.0	90.3	78.9	90.3	78.4	84.1	74.9	7951	90.8
1999	3198.2	605.0	64.7	78.3	64.7	77.8	60.3	74.3	5667	64.7
2000	3898.5	605.0	85.3	78.6	85.3	78.1	73.4	74.3	7525	85.7
2001	4748.5	602.0	92.3	79.1	92.3	78.6	90.0	74.8	8113	92.6
2002	4508.6	602.0	91.2	79.6	90.6	79.1	85.5	75.2	8043	91.8
2003	3055.3	602.0	59.5	78.8	58.3	78.3	57.9	74.6	5289	60.4
2004	4625.9	602.0	89.1	79.2	87.7	78.7	87.5	75.1	7900	89.9
2005	4728.1	602.0	92.3	79.6	90.0	79.0	89.7	75.5	8187	93.5
2006	4125.3	602.0	79.7	79.6	78.4	79.0	78.2	75.6	7089	80.9
2007	3993.2	598.0	77.7	79.6	76.4	78.9	76.2	75.6	6922	79.0
2008	4504.2	590.0	88.7	79.8	86.6	79.2	86.3	76.0	7871	89.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		112		1	205	
B. Refuelling without a maintenance outage					2	
C. Inspection, maintenance or repair combined with refuelling	587	188		895	95	
D. Inspection, maintenance or repair without refuelling				43		
E. Testing of plant systems or component				0	2	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				16	3	
H. Nuclear regulatory requirement					131	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					84	2
L. Human factor related		32			0	
P. Fire					1	
Z. Others					4	
Subtotal	587	332	0	955	527	3
Total	919			1485		

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		26
12. Reactor I&C Systems	73	9
13. Reactor Auxiliary Systems		0
14. Safety Systems		7
15. Reactor Cooling Systems		22
17. Safety I&C Systems (excluding reactor I&C)	39	
31. Turbine and auxiliaries		93
32. Feedwater and Main Steam System		18
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator Systems		5
42. Electrical Power Supply Systems		1
XX. Miscellaneous Systems		0
Total	112	181

## SE-12 OSKARSHAMN-3

**Operator:** OKG (OKG AKTIEBOLAG)

**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1150.0 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 2008

**Net Energy Production:** 7100.9 GW(e).h  
**Energy Availability Factor:** 70.3%  
**Load Factor:** 70.4%  
**Operating Factor:** 73.3%  
**Energy Unavailability Factor:** 29.7%  
**Total Off-line Time:** 2336 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	852.7	561.6	850.5	823.7	840.1	808.9	836.7	774.6	729.2	22.9	0.0	0.0	7100.9
<b>EAF (%)</b>	99.4	68.8	99.4	99.2	98.3	97.9	97.7	90.4	90.6	2.7	0.0	0.0	70.3
<b>UCF (%)</b>	99.7	69.1	99.9	99.9	99.8	99.6	99.8	94.1	91.0	2.8	0.0	0.0	71.3
<b>LF (%)</b>	99.7	72.7	99.4	99.6	98.2	97.7	97.6	90.4	87.9	2.7	0.0	0.0	70.4
<b>OF (%)</b>	100.0	77.2	99.9	100.1	100.0	100.0	100.0	100.0	100.0	3.5	0.0	0.0	73.3
<b>EUF (%)</b>	0.6	31.2	0.6	0.8	1.7	2.1	2.3	9.6	9.4	97.3	100.0	100.0	29.7
<b>PUF (%)</b>	0.0	28.5	0.0	0.0	0.1	0.0	0.0	0.0	0.1	67.4	0.0	0.0	7.9
<b>UCLF (%)</b>	0.3	2.4	0.1	0.1	0.0	0.4	0.2	5.9	9.0	29.8	100.0	100.0	20.8
<b>XUF (%)</b>	0.3	0.3	0.5	0.7	1.5	1.7	2.1	3.6	0.3	0.1	0.0	0.0	0.9

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

AN UPDATE REGARDING RUP WAS IMPLEMENTED IN JULY FOR ALL UNITS. FOR UNIT THREE IT MEANS AN UPRATE TO 1152 MWE (NET). DURING THE ANNUAL OUTAGE WITH REFUELLING IT WAS DISCOVERED CRACKS IN A NUMBER OF CONTROL ROD SHAFTS. THE SHAFTS HAD TO BE REPLACED AND THE OUTAGE WAS EXTENDED TO END OF THE YEAR.



## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1980	<b>Lifetime Generation:</b>	195103.7 GW(e).h
<b>Date of First Criticality:</b>	29 Dec 1984	<b>Cumulative Energy Availability Factor:</b>	86.7%
<b>Date of Grid Connection:</b>	03 Mar 1985	<b>Cumulative Load Factor:</b>	83.1%
<b>Date of Commercial Operation:</b>	15 Aug 1985	<b>Cumulative Unit Capability Factor:</b>	87.5%
		<b>Cumulative Energy Unavailability Factor:</b>	13.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	3070.3	1068.0	92.7	92.7	92.7	92.7	79.6	79.6	3429	93.4
1986	8386.9	1070.0	90.1	90.9	90.1	90.9	89.5	86.6	8111	92.6
1987	7058.0	1070.0	79.6	86.2	79.6	86.2	75.3	81.9	7988	91.2
1988	7311.9	1065.0	82.1	85.0	82.1	85.0	78.2	80.8	7458	84.9
1989	7788.2	1083.0	91.3	86.4	91.3	86.4	82.0	81.1	8242	94.1
1990	7640.2	1088.0	82.2	85.6	82.2	85.6	80.1	80.9	7782	88.8
1991	8935.8	1160.0	89.3	86.2	89.3	86.2	87.9	82.1	8184	93.4
1992	8270.6	1160.0	82.6	85.7	82.5	85.7	81.2	81.9	7904	90.0
1993	8339.5	1160.0	91.6	86.5	83.8	85.5	82.1	82.0	8034	91.7
1994	8480.4	1160.0	85.0	86.3	84.9	85.4	83.5	82.1	7832	89.4
1995	8828.1	1160.0	89.8	86.6	87.5	85.6	86.9	82.6	7957	90.8
1996	8518.6	1160.0	85.2	86.5	85.0	85.6	83.6	82.7	7519	85.6
1997	8970.4	1160.0	91.1	86.9	91.1	86.0	88.3	83.2	8017	91.5
1998	8032.3	1160.0	89.4	87.1	89.4	86.3	79.0	82.8	7914	90.3
1999	8516.6	1160.0	89.2	87.2	89.2	86.5	83.8	82.9	7850	89.6
2000	7219.1	1160.0	91.2	87.5	91.2	86.8	70.8	82.1	8075	91.9
2001	9052.0	1160.0	92.6	87.8	92.6	87.2	89.1	82.5	8160	93.2
2002	8884.0	1160.0	92.3	88.1	92.3	87.5	87.4	82.8	8140	92.9
2003	7678.0	1160.0	78.0	87.5	76.2	86.9	75.6	82.4	6871	78.4
2004	9318.5	1160.0	93.1	87.8	92.6	87.2	91.5	82.9	8236	93.8
2005	8573.4	1160.0	86.7	87.8	85.5	87.1	84.4	83.0	7671	87.6
2006	9522.5	1160.0	96.3	88.2	95.0	87.4	93.7	83.5	8467	96.7
2007	8829.2	1150.0	89.6	88.2	87.8	87.5	87.6	83.7	7965	90.9
2008	7100.9	1152.0	71.3	87.5	70.3	86.7	70.4	83.1	6424	73.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		12			104	
B. Refuelling without a maintenance	165			5	10	
C. Inspection, maintenance or repair combined with refuelling	502	1610		548	19	
D. Inspection, maintenance or repair without refuelling				22		
H. Nuclear regulatory requirement		71			46	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					18	
L. Human factor related					0	
Z. Others					5	
Subtotal	667	1693	0	575	202	0
Total		2360			777	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		11
13. Reactor Auxiliary Systems		3
14. Safety Systems		11
15. Reactor Cooling Systems		23
21. Fuel Handling and Storage Facilities		11
31. Turbine and auxiliaries	12	15
32. Feedwater and Main Steam System		13
35. All other I&C Systems		0

Total	12	100
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## SE-4 RINGHALS-1

**Operator:** RAB (Ringhals AB)

**Contractor:** ABBATOM (ABBATOM (formerly ASEA-ATOM))

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 856.0 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 2008

**Net Energy Production:** 4552.7 GW(e).h  
**Energy Availability Factor:** 60.5%  
**Load Factor:** 60.7%  
**Operating Factor:** 62.6%  
**Energy Unavailability Factor:** 39.5%  
**Total Off-line Time:** 3280 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	637.4	596.7	637.3	610.6	618.3	595.7	595.7	261.1	0.0	0.0	0.0	0.0	4552.7
<b>EAF (%)</b>	100.0	100.0	100.0	99.5	97.1	96.6	93.5	41.0	0.0	0.1	0.0	0.0	60.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	99.0	100.0	99.5	47.4	0.0	0.1	0.0	0.0	62.0
<b>LF (%)</b>	100.1	103.7	100.1	99.2	97.1	96.6	93.5	41.0	0.0	0.0	0.0	0.0	60.7
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	49.5	0.0	0.0	0.0	0.0	62.6
<b>EUF (%)</b>	0.0	0.0	0.0	0.5	2.9	3.4	6.5	59.0	100.0	99.9	100.0	100.0	39.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.5	51.6	100.0	9.6	100.0	54.5	26.3
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.1	0.0	90.3	0.0	45.5	11.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.5	1.9	3.4	6.0	6.4	0.0	0.0	0.0	0.0	1.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

REFERENS UNIT POWER IS SET TO 856 MW DUE TO EXCHANGE OF HIGH PRESSURE TURBIN IN 2006 AND IMPROVED MEASUREMENT OF FEEDWATERFLOW.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Feb 1969	<b>Lifetime Generation:</b>	157966.0 GW(e).h
<b>Date of First Criticality:</b>	20 Aug 1973	<b>Cumulative Energy Availability Factor:</b>	72.5%
<b>Date of Grid Connection:</b>	14 Oct 1974	<b>Cumulative Load Factor:</b>	68.3%
<b>Date of Commercial Operation:</b>	01 Jan 1976	<b>Cumulative Unit Capability Factor:</b>	73.4%
		<b>Cumulative Energy Unavailability Factor:</b>	27.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976	2164.6	760.0	32.4	32.4	32.4	32.4	32.4	32.4	4269	48.6
1977	3531.2	760.0	53.0	42.7	53.0	42.7	53.0	42.7	6095	69.6
1978	4153.1	750.0	63.2	49.5	63.2	49.5	63.2	49.5	6099	69.6
1979	3868.2	750.0	58.9	51.8	58.9	51.8	58.9	51.8	6070	69.3
1980	4433.8	750.0	68.8	55.2	68.2	55.1	67.3	54.9	6362	72.4
1981	4059.4	750.0	61.8	56.3	61.8	56.2	61.8	56.0	6285	71.7
1982	4687.5	750.0	74.9	58.9	74.9	58.8	71.3	58.2	7162	81.8
1983	3265.0	750.0	49.7	57.8	49.7	57.7	49.7	57.2	5372	61.3
1984	4917.7	750.0	79.8	60.2	79.7	60.1	74.6	59.1	7382	84.0
1985	5168.8	750.0	86.0	62.8	86.0	62.7	78.7	61.0	7832	89.4
1986	4470.5	750.0	69.9	63.4	69.9	63.4	68.0	61.7	7203	82.2
1987	4872.7	750.0	77.7	64.6	77.7	64.6	74.2	62.7	7878	89.9
1988	4694.7	750.0	75.1	65.4	74.7	65.3	71.3	63.4	7338	83.5
1989	4855.3	755.0	81.8	66.6	81.8	66.5	73.4	64.1	7963	90.9
1990	4525.6	795.0	71.6	66.9	71.4	66.9	65.0	64.2	7918	90.4
1991	5638.9	795.0	82.6	68.0	82.5	67.9	81.0	65.3	8034	91.7
1992	3383.8	795.0	51.2	66.9	51.2	66.9	48.5	64.2	4938	56.2
1993	3996.4	795.0	68.5	67.0	68.5	67.0	57.4	63.8	6575	75.1
1994	5389.2	795.0	78.0	67.6	76.4	67.5	77.4	64.6	7189	82.1
1995	5667.0	826.0	78.3	68.2	78.2	68.1	78.3	65.3	7697	87.9
1996	6490.9	832.0	90.3	69.3	90.1	69.2	88.7	66.5	8008	91.2
1997	2035.6	830.0	97.3	70.7	95.8	70.5	28.0	64.6	2663	30.4
1998	5601.6	830.0	84.8	71.4	80.7	71.0	77.0	65.2	7605	86.8
1999	4930.4	825.0	73.3	71.5	68.4	70.8	68.2	65.3	6500	74.2
2000	3239.7	825.0	57.2	70.8	50.8	70.0	44.7	64.5	4659	53.0
2001	5835.0	825.0	86.1	71.5	86.1	70.7	80.7	65.1	7814	89.2
2002	5956.2	830.0	84.7	72.0	80.4	71.0	81.9	65.8	7667	87.5
2003	5104.3	830.0	70.4	71.9	70.2	71.0	70.2	66.0	6269	71.6
2004	6523.1	830.0	90.1	72.6	89.7	71.7	89.5	66.8	7974	90.8
2005	6064.8	830.0	83.9	73.0	83.5	72.1	83.4	67.4	7452	85.1
2006	6518.8	843.0	89.9	73.6	87.9	72.6	88.3	68.1	7982	91.1
2007	5963.4	843.0	81.1	73.8	79.4	72.9	80.8	68.5	7275	83.0
2008	4552.7	856.0	62.0	73.4	60.5	72.5	60.7	68.3	5480	62.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure	1164	1011			557	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1142			962	38	
D. Inspection, maintenance or repair without refuelling				2		
E. Testing of plant systems or component					5	
H. Nuclear regulatory requirement						13
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					28	10
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. Others					13	
Subtotal	2306	1011	0	964	644	25
Total		3317			1633	

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		174
12. Reactor I&C Systems	339	71
13. Reactor Auxiliary System		19
14. Safety Systems	1836	45
15. Reactor Cooling System		110
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		37
35. All other I&C Systems		1
41. Main Generator System		0
42. Electrical Power Supply System		11
XX. Miscellaneous Systems		0
Total	2175	497

## SE-5 RINGHALS-2

**Operator:** RAB (Ringhals AB)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 867.0 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 2008

**Net Energy Production:** 5746.3 GW(e).h  
**Energy Availability Factor:** 78.0%  
**Load Factor:** 75.7%  
**Operating Factor:** 81.9%  
**Energy Unavailability Factor:** 22.0%  
**Total Off-line Time:** 1585 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	637.0	453.2	643.7	619.3	17.1	159.9	546.1	374.3	539.8	576.2	578.7	601.0	5746.3
<b>EAF (%)</b>	98.8	74.3	100.0	99.0	2.5	25.4	84.4	89.9	86.2	89.1	92.5	93.3	78.0
<b>UCF (%)</b>	99.3	74.3	100.0	100.0	2.5	28.7	90.0	94.5	89.9	91.3	93.5	93.3	79.8
<b>LF (%)</b>	98.7	77.8	99.8	99.4	2.6	25.6	84.7	58.0	86.5	89.2	92.7	93.2	75.7
<b>OF (%)</b>	99.6	78.9	100.0	100.1	3.2	31.4	100.0	69.6	100.0	99.9	100.0	100.0	81.9
<b>EUF (%)</b>	1.2	25.7	0.0	1.0	97.5	74.6	15.6	10.1	13.8	10.9	7.5	6.7	22.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	84.6	1.6	5.6	5.5	10.1	8.7	6.5	6.7	10.9
<b>UCLF (%)</b>	0.7	25.7	0.0	0.0	12.9	69.7	4.4	0.0	0.0	0.0	0.0	0.0	9.2
<b>XUF (%)</b>	0.5	0.0	0.0	1.0	0.0	3.3	5.6	4.6	3.6	2.2	1.0	0.0	1.8

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

SINCE JANUARY 2009 THE REFERENS UNIT POWER WILL BE SET TO 813 MW DUE TO MAX LOAD LIMIT IS 94% REACTOR POWER (REDUCED AUXILIARY FEEDWATERFLOW) TO FULL OUTAGE 2010.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Oct 1970	<b>Lifetime Generation:</b>	172856.0 GW(e).h
<b>Date of First Criticality:</b>	19 Jun 1974	<b>Cumulative Energy Availability Factor:</b>	72.1%
<b>Date of Grid Connection:</b>	17 Aug 1974	<b>Cumulative Load Factor:</b>	67.9%
<b>Date of Commercial Operation:</b>	01 May 1975	<b>Cumulative Unit Capability Factor:</b>	73.5%
		<b>Cumulative Energy Unavailability Factor:</b>	27.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	2162.0	820.0	44.9	44.9	44.9	44.9	44.8	44.8	3382	57.5
1976	4213.0	822.0	59.4	53.6	59.4	53.6	58.3	52.9	6167	70.2
1977	4114.4	822.0	57.1	54.9	57.1	54.9	57.1	54.5	6402	73.1
1978	4094.4	800.0	58.4	55.8	58.4	55.8	58.4	55.6	6772	77.3
1979	3585.3	800.0	51.2	54.9	51.2	54.9	51.2	54.6	5541	63.3
1980	4336.9	800.0	61.7	56.1	61.7	56.1	61.7	55.9	5824	66.3
1981	4093.2	800.0	58.4	56.4	58.4	56.4	58.4	56.2	6216	71.0
1982	4548.0	800.0	66.3	57.7	66.3	57.7	64.9	57.4	5922	67.6
1983	3935.3	800.0	56.2	57.5	56.2	57.5	56.2	57.2	6107	69.7
1984	4178.7	800.0	68.3	58.6	68.2	58.6	59.5	57.5	6090	69.3
1985	4294.7	800.0	74.8	60.1	74.8	60.1	61.3	57.8	6680	76.3
1986	3969.1	800.0	59.4	60.1	59.4	60.1	56.6	57.7	6383	72.9
1987	4216.6	800.0	65.2	60.5	65.2	60.5	60.2	57.9	7397	84.4
1988	4216.1	800.0	68.5	61.1	68.5	61.0	60.0	58.1	7368	83.9
1989	3619.6	800.0	50.0	60.3	50.0	60.3	51.6	57.6	6002	68.5
1990	5064.8	800.0	66.7	60.7	66.7	60.7	72.3	58.6	6348	72.5
1991	6232.8	875.0	83.5	62.2	83.5	62.2	81.3	60.0	7909	90.3
1992	5193.4	875.0	72.1	62.8	72.1	62.8	67.6	60.5	6959	79.2
1993	2650.0	875.0	37.8	61.4	37.8	61.4	34.6	59.0	3307	37.8
1994	6258.7	875.0	84.7	62.6	83.0	62.5	81.7	60.2	7429	84.8
1995	6096.6	867.0	85.6	63.8	84.8	63.7	80.3	61.3	7676	87.6
1996	5723.3	864.0	84.6	64.8	76.8	64.3	75.4	61.9	7574	86.2
1997	2372.1	864.0	98.8	66.4	98.2	65.9	31.3	60.5	2748	31.4
1998	6096.4	875.0	90.5	67.5	82.2	66.6	79.5	61.4	7866	89.8
1999	6445.8	862.0	92.2	68.5	85.8	67.4	85.4	62.4	8075	92.2
2000	5143.5	862.0	84.8	69.2	77.0	67.8	67.9	62.6	7284	82.9
2001	6322.7	862.0	87.0	69.9	85.7	68.5	83.7	63.4	8004	91.4
2002	6540.3	875.0	89.2	70.6	84.3	69.1	85.3	64.3	8130	92.8
2003	6811.5	875.0	92.5	71.4	90.9	69.9	88.9	65.2	8093	92.4
2004	6786.6	875.0	90.3	72.1	90.3	70.6	88.3	66.0	7976	90.8
2005	5784.4	875.0	78.4	72.3	77.9	70.9	75.5	66.3	6874	78.5
2006	6839.4	867.0	91.7	72.9	89.7	71.5	90.1	67.1	8107	92.5
2007	6365.1	867.0	85.2	73.3	83.7	71.9	83.8	67.6	7782	88.8
2008	5746.3	867.0	79.8	73.5	78.0	72.1	75.7	67.9	7175	81.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		677			661	
B. Refuelling without a maintenance outage					0	
C. Inspection, maintenance or repair combined with refuelling	630	95		945		
D. Inspection, maintenance or repair without refuelling				79		
E. Testing of plant systems or component				2		
H. Nuclear regulatory requirement					4	
J. Grid limitation, failure or grid unavailability			249			5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						7
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Z. Others					1	
Subtotal	630	772	249	1026	666	13
Total	1651			1705		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		176
12. Reactor I&C Systems		7
14. Safety Systems	677	74
15. Reactor Cooling System		16
16. Steam generation system		220
21. Fuel Handling and Storage Facilities		45
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		34
33. Circulating Water System		0
35. All other I&C Systems		0
41. Main Generator System		34
42. Electrical Power Supply System		28
Total	677	649



## SE-7 RINGHALS-3

**Operator:** RAB (Ringhals AB)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 985.0 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 2008

**Net Energy Production:** 7599.8 GW(e).h  
**Energy Availability Factor:** 87.8%  
**Load Factor:** 88.1%  
**Operating Factor:** 91.1%  
**Energy Unavailability Factor:** 12.2%  
**Total Off-line Time:** 780 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	700.3	688.7	732.6	705.1	715.2	673.3	380.7	183.0	635.3	729.4	711.6	744.7	7599.8
<b>EAF (%)</b>	95.8	100.0	100.0	100.0	97.9	95.2	52.3	25.3	89.9	100.0	99.0	100.0	87.8
<b>UCF (%)</b>	95.8	100.0	100.0	100.0	100.0	98.8	55.1	26.8	91.8	100.0	100.0	100.0	88.8
<b>LF (%)</b>	95.6	104.0	100.0	99.6	97.6	94.9	51.9	25.0	89.6	99.4	100.3	101.6	88.1
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	55.2	37.5	99.2	99.9	100.0	100.0	91.1
<b>EUF (%)</b>	4.2	0.0	0.0	0.0	2.1	4.8	47.7	74.7	10.1	0.0	1.0	0.0	12.2
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	1.2	44.9	29.3	1.7	0.0	0.0	0.0	6.5
<b>UCLF (%)</b>	4.2	0.0	0.0	0.0	0.0	0.0	0.0	43.9	6.6	0.0	0.0	0.0	4.6
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	2.1	3.6	2.8	1.5	1.9	0.0	1.0	0.0	1.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

IN 2006 WE EXCHANGED LOWPRESSURE TURBIN. AND IN 2007 WE EXCHANGED HIGHPRESSURE TURBIN, WE CALCULATIED WITH 1045 MW, BUT IT STOPPED WITH 985 MW. IN JANUARY 2009 WE HAVE SET RUP(NET) TO 1000 MW AFTER NEW CALCULATIONS.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Sep 1972	<b>Lifetime Generation:</b>	166728.0 GW(e).h
<b>Date of First Criticality:</b>	29 Jul 1980	<b>Cumulative Energy Availability Factor:</b>	77.4%
<b>Date of Grid Connection:</b>	07 Sep 1980	<b>Cumulative Load Factor:</b>	72.3%
<b>Date of Commercial Operation:</b>	09 Sep 1981	<b>Cumulative Unit Capability Factor:</b>	79.0%
		<b>Cumulative Energy Unavailability Factor:</b>	22.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	721.0	920.0	26.7	26.7	26.7	26.7	26.8	26.8	864	29.5
1982	1251.6	915.0	15.6	18.4	15.6	18.4	15.6	18.4	3680	42.0
1983	2909.9	867.0	38.2	26.7	38.2	26.7	38.2	26.7	5886	67.2
1984	5346.6	915.0	72.4	40.6	72.4	40.6	66.5	38.8	6450	73.4
1985	6090.3	915.0	84.8	50.9	84.8	50.9	76.0	47.5	7580	86.5
1986	6233.9	915.0	78.8	56.2	78.8	56.2	77.8	53.2	7026	80.2
1987	6169.2	915.0	83.1	60.5	83.1	60.5	77.0	57.0	7485	85.4
1988	6151.2	915.0	77.1	62.8	77.1	62.8	76.5	59.7	7645	87.0
1989	5829.7	915.0	82.6	65.2	82.6	65.2	72.7	61.3	7757	88.6
1990	5871.3	915.0	74.2	66.1	74.0	66.1	73.2	62.5	7855	89.7
1991	5923.6	915.0	75.7	67.1	75.7	67.0	73.9	63.6	8007	91.4
1992	5622.1	915.0	82.3	68.4	82.3	68.4	69.9	64.2	7941	90.4
1993	6685.8	915.0	89.8	70.1	89.8	70.1	83.4	65.8	7964	90.9
1994	6873.4	918.0	86.1	71.4	86.1	71.3	85.5	67.3	8097	92.4
1995	4873.6	918.0	60.7	70.6	60.7	70.6	60.6	66.8	6040	68.9
1996	6816.8	910.0	92.5	72.0	87.3	71.7	85.3	68.0	8166	93.0
1997	2284.3	910.0	95.5	73.5	95.5	73.1	28.7	65.6	2809	32.1
1998	6382.6	915.0	90.2	74.4	81.3	73.6	79.6	66.4	8008	91.4
1999	6976.0	911.0	90.0	75.3	88.0	74.4	87.4	67.5	7899	90.2
2000	6165.8	911.0	92.3	76.2	89.5	75.2	77.1	68.0	7966	90.7
2001	6285.3	911.0	88.6	76.8	79.4	75.4	78.8	68.6	7942	90.7
2002	6890.6	915.0	90.8	77.4	88.8	76.0	86.0	69.4	7930	90.5
2003	6714.6	915.0	85.3	77.8	84.4	76.4	83.8	70.0	7475	85.3
2004	7497.9	915.0	94.0	78.5	93.9	77.1	93.3	71.0	8295	94.4
2005	7181.6	915.0	91.2	79.0	90.5	77.7	89.6	71.8	8075	92.2
2006	6570.8	917.0	81.8	79.1	75.0	77.6	76.4	72.0	7249	82.8
2007	5990.8	1045.0	67.0	78.6	64.3	77.0	65.4	71.7	6565	74.9
2008	7599.8	985.0	88.8	79.0	87.8	77.4	88.1	72.3	7980	91.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		290			333	
C. Inspection, maintenance or repair combined with refuelling	532			630	16	
D. Inspection, maintenance or repair without refuelling				267		
E. Testing of plant systems or component:	16			5	1	
H. Nuclear regulatory requirement				3		
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						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. Others					3	
Subtotal	548	290	0	905	357	7
Total	838			1269		

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	223	19
12. Reactor I&C Systems		1
15. Reactor Cooling System:		55
16. Steam generation system:		164
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries:		41
32. Feedwater and Main Steam System		13
41. Main Generator System:	67	11
42. Electrical Power Supply System:		24
Total	290	328

# SE-10 RINGHALS-4

Operator: RAB (Ringhals AB)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 935.0 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 2008

Net Energy Production: 7331.9 GW(e).h  
 Energy Availability Factor: 88.9%  
 Load Factor: 89.5%  
 Operating Factor: 91.8%  
 Energy Unavailability Factor: 11.1%  
 Total Off-line Time: 714 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	698.9	655.1	700.1	672.0	611.9	64.8	597.3	638.5	647.4	680.2	667.9	697.9	7331.9
EAF (%)	100.0	100.0	100.0	99.3	87.7	9.1	85.3	93.8	95.6	97.2	98.7	100.0	88.9
UCF (%)	100.0	100.0	100.0	100.0	90.4	9.8	92.0	100.0	100.0	100.0	100.0	100.0	91.1
LF (%)	100.5	104.3	100.6	100.0	88.0	9.6	85.9	91.8	96.2	97.6	99.2	100.3	89.5
OF (%)	100.0	103.6	100.0	100.1	91.0	13.2	93.8	100.0	100.0	99.9	100.0	100.0	91.8
EUf (%)	0.0	0.0	0.0	0.7	12.3	90.9	14.7	6.2	4.4	2.8	1.3	0.0	11.1
PUf (%)	0.0	0.0	0.0	0.0	9.6	81.1	0.0	0.0	0.0	0.0	0.0	0.0	7.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	9.1	8.0	0.0	0.0	0.0	0.0	0.0	1.4
XUF (%)	0.0	0.0	0.0	0.7	2.8	0.7	6.6	6.2	4.4	2.8	1.3	0.0	2.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

IN 2007 WE EXCHANGED LOWPRESSURE TURBIN AND RUP(NET) WAS UPRTATED TO 935 MW.

## 5. Historical Summary

Date of Construction Start: 01 Nov 1973      Lifetime Generation: 162961.0 GW(e).h  
 Date of First Criticality: 19 May 1982      Cumulative Energy Availability Factor: 85.3%  
 Date of Grid Connection: 23 Jun 1982      Cumulative Load Factor: 78.0%  
 Date of Commercial Operation: 21 Nov 1983      Cumulative Unit Capability Factor: 87.1%  
    Cumulative Energy Unavailability Factor: 14.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	879.6	915.0	65.7	65.7	65.7	65.7	65.7	65.7	1275	87.1
1984	5987.7	915.0	82.3	79.9	82.2	79.8	74.5	73.2	7517	85.6
1985	5923.7	915.0	87.9	83.6	87.9	83.6	73.9	73.5	7755	88.5
1986	5619.3	915.0	70.7	79.5	70.7	79.5	70.1	72.5	6839	78.1
1987	5665.9	915.0	88.2	81.6	88.2	81.6	70.7	72.0	7827	89.3
1988	6641.7	915.0	83.4	82.0	83.4	81.9	82.6	74.1	7945	90.4
1989	5536.8	915.0	85.8	82.6	85.8	82.6	69.1	73.3	7624	87.0
1990	6467.3	915.0	89.1	83.5	89.1	83.5	80.7	74.3	8080	92.2
1991	6916.2	915.0	85.9	83.8	85.9	83.8	86.3	75.8	8041	91.8
1992	6432.4	915.0	90.1	84.5	90.0	84.5	80.0	76.2	8156	92.9
1993	6342.3	915.0	88.8	84.9	88.8	84.9	79.1	76.5	7906	90.3
1994	6234.7	914.0	84.8	84.9	84.8	84.9	77.9	76.6	7476	85.3
1995	6251.7	912.0	88.4	85.2	80.6	84.5	78.3	76.8	7684	87.7
1996	6426.8	912.0	91.8	85.7	79.6	84.1	80.2	77.0	8067	91.8
1997	2560.0	912.0	98.9	86.6	98.9	85.2	32.0	73.9	2783	31.8
1998	6809.8	915.0	92.5	87.0	86.5	85.3	85.0	74.6	8146	93.0
1999	6986.8	907.0	91.7	87.3	88.6	85.5	87.9	75.4	8042	91.8
2000	4060.7	907.0	66.5	86.1	63.4	84.2	51.0	74.0	5898	67.1
2001	6624.0	909.0	88.4	86.2	86.5	84.3	83.2	74.5	7758	88.6
2002	5942.2	915.0	80.2	85.9	75.5	83.9	74.1	74.5	7056	80.5
2003	6996.5	915.0	89.2	86.1	88.9	84.1	87.3	75.1	7843	89.5
2004	7209.6	915.0	92.1	86.3	92.1	84.5	89.7	75.8	8092	92.1
2005	7129.8	915.0	91.5	86.6	91.4	84.8	89.0	76.4	8073	92.2
2006	7092.4	907.0	91.2	86.8	88.7	85.0	89.3	77.0	8054	91.9
2007	7192.9	907.0	91.0	86.9	89.4	85.2	90.5	77.5	8126	92.8
2008	7331.9	935.0	91.1	87.1	88.9	85.3	89.5	78.0	8046	91.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		99			156	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	639			670	1	
D. Inspection, maintenance or repair without refuelling				222		
E. Testing of plant systems or component				39	17	
H. Nuclear regulatory requirement					3	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	
L. Human factor related					3	
Z. Others				1	16	
Subtotal	639	99	0	932	196	0
Total		738			1128	

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	54	17
12. Reactor I&C Systems		2
13. Reactor Auxiliary System		3
14. Safety Systems		1
15. Reactor Cooling System	45	78
16. Steam generation system		32
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		19
Total	99	153

# SE-10 RINGHALS-4

Operator: RAB (Ringhals AB)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 935.0 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 2008

Net Energy Production: 7331.9 GW(e).h  
 Energy Availability Factor: 88.9%  
 Load Factor: 89.5%  
 Operating Factor: 91.8%  
 Energy Unavailability Factor: 11.1%  
 Total Off-line Time: 714 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	698.9	655.1	700.1	672.0	611.9	64.8	597.3	638.5	647.4	680.2	667.9	697.9	7331.9
EAF (%)	100.0	100.0	100.0	99.3	87.7	9.1	85.3	93.8	95.6	97.2	98.7	100.0	88.9
UCF (%)	100.0	100.0	100.0	100.0	90.4	9.8	92.0	100.0	100.0	100.0	100.0	100.0	91.1
LF (%)	100.5	104.3	100.6	100.0	88.0	9.6	85.9	91.8	96.2	97.6	99.2	100.3	89.5
OF (%)	100.0	103.6	100.0	100.1	91.0	13.2	93.8	100.0	100.0	99.9	100.0	100.0	91.8
EUf (%)	0.0	0.0	0.0	0.7	12.3	90.9	14.7	6.2	4.4	2.8	1.3	0.0	11.1
PUf (%)	0.0	0.0	0.0	0.0	9.6	81.1	0.0	0.0	0.0	0.0	0.0	0.0	7.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	9.1	8.0	0.0	0.0	0.0	0.0	0.0	1.4
XUF (%)	0.0	0.0	0.0	0.7	2.8	0.7	6.6	6.2	4.4	2.8	1.3	0.0	2.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

IN 2007 WE EXCHANGED LOWPRESSURE TURBIN AND RUP(NET) WAS UPRTATED TO 935 MW.

## 5. Historical Summary

Date of Construction Start: 01 Nov 1973      Lifetime Generation: 162961.0 GW(e).h  
 Date of First Criticality: 19 May 1982      Cumulative Energy Availability Factor: 85.3%  
 Date of Grid Connection: 23 Jun 1982      Cumulative Load Factor: 78.0%  
 Date of Commercial Operation: 21 Nov 1983      Cumulative Unit Capability Factor: 87.1%  
    Cumulative Energy Unavailability Factor: 14.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	879.6	915.0	65.7	65.7	65.7	65.7	65.7	65.7	1275	87.1
1984	5987.7	915.0	82.3	79.9	82.2	79.8	74.5	73.2	7517	85.6
1985	5923.7	915.0	87.9	83.6	87.9	83.6	73.9	73.5	7755	88.5
1986	5619.3	915.0	70.7	79.5	70.7	79.5	70.1	72.5	6839	78.1
1987	5665.9	915.0	88.2	81.6	88.2	81.6	70.7	72.0	7827	89.3
1988	6641.7	915.0	83.4	82.0	83.4	81.9	82.6	74.1	7945	90.4
1989	5536.8	915.0	85.8	82.6	85.8	82.6	69.1	73.3	7624	87.0
1990	6467.3	915.0	89.1	83.5	89.1	83.5	80.7	74.3	8080	92.2
1991	6916.2	915.0	85.9	83.8	85.9	83.8	86.3	75.8	8041	91.8
1992	6432.4	915.0	90.1	84.5	90.0	84.5	80.0	76.2	8156	92.9
1993	6342.3	915.0	88.8	84.9	88.8	84.9	79.1	76.5	7906	90.3
1994	6234.7	914.0	84.8	84.9	84.8	84.9	77.9	76.6	7476	85.3
1995	6251.7	912.0	88.4	85.2	80.6	84.5	78.3	76.8	7684	87.7
1996	6426.8	912.0	91.8	85.7	79.6	84.1	80.2	77.0	8067	91.8
1997	2560.0	912.0	98.9	86.6	98.9	85.2	32.0	73.9	2783	31.8
1998	6809.8	915.0	92.5	87.0	86.5	85.3	85.0	74.6	8146	93.0
1999	6986.8	907.0	91.7	87.3	88.6	85.5	87.9	75.4	8042	91.8
2000	4060.7	907.0	66.5	86.1	63.4	84.2	51.0	74.0	5898	67.1
2001	6624.0	909.0	88.4	86.2	86.5	84.3	83.2	74.5	7758	88.6
2002	5942.2	915.0	80.2	85.9	75.5	83.9	74.1	74.5	7056	80.5
2003	6996.5	915.0	89.2	86.1	88.9	84.1	87.3	75.1	7843	89.5
2004	7209.6	915.0	92.1	86.3	92.1	84.5	89.7	75.8	8092	92.1
2005	7129.8	915.0	91.5	86.6	91.4	84.8	89.0	76.4	8073	92.2
2006	7092.4	907.0	91.2	86.8	88.7	85.0	89.3	77.0	8054	91.9
2007	7192.9	907.0	91.0	86.9	89.4	85.2	90.5	77.5	8126	92.8
2008	7331.9	935.0	91.1	87.1	88.9	85.3	89.5	78.0	8046	91.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		99			156	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	639			670	1	
D. Inspection, maintenance or repair without refuelling				222		
E. Testing of plant systems or component				39	17	
H. Nuclear regulatory requirement					3	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	
L. Human factor related					3	
Z. Others				1	16	
Subtotal	639	99	0	932	196	0
Total	738			1128		

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	54	17
12. Reactor I&C Systems		2
13. Reactor Auxiliary System		3
14. Safety Systems		1
15. Reactor Cooling System	45	78
16. Steam generation system		32
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		19
Total	99	153

## CH-1 BEZNAU-1

**Operator:** NOK (NORDOSTSCHWEIZERISCHE KRAFTWERKE)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2956.6 GW(e).h  
**Energy Availability Factor:** 92.4%  
**Load Factor:** 92.5%  
**Operating Factor:** 93.0%  
**Energy Unavailability Factor:** 7.6%  
**Total Off-line Time:** 617 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	273.0	255.4	272.6	263.8	270.9	46.0	239.5	265.8	260.3	271.8	264.1	273.4	2956.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	18.2	90.1	100.0	100.0	100.0	100.0	100.0	92.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	18.2	90.1	100.0	100.0	100.0	100.0	100.0	92.4
<b>LF (%)</b>	100.5	104.1	100.4	100.5	99.7	17.5	88.2	97.9	99.0	100.0	100.5	100.7	92.5
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	18.6	92.6	100.0	100.0	100.0	100.0	100.0	93.0
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	81.8	9.9	0.0	0.0	0.0	0.0	0.0	7.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	81.8	8.7	0.0	0.0	0.0	0.0	0.0	7.5
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.2	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

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## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1965  
**Date of First Criticality:** 30 Jun 1969  
**Date of Grid Connection:** 17 Jul 1969  
**Date of Commercial Operation:** 01 Sep 1969

**Lifetime Generation:** 101270.7 GW(e).h  
**Cumulative Energy Availability Factor:** 84.2%  
**Cumulative Load Factor:** 82.8%  
**Cumulative Unit Capability Factor:** 84.5%  
**Cumulative Energy Unavailability Factor:** 15.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1969	0.0	364.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1970	1947.0	364.0	61.1	70.8	61.1	70.8	61.1	45.8	5917	67.5
1971	1700.5	364.0	59.0	65.7	59.0	65.7	53.3	49.0	5123	58.5
1972	1402.9	280.0	61.3	64.6	61.3	64.6	57.0	51.0	5391	61.4
1973	1655.0	350.0	71.6	66.3	71.6	66.3	54.0	51.7	6654	76.0
1974	2346.7	350.0	78.1	68.5	78.1	68.5	76.5	56.5	7177	81.9
1975	2490.9	350.0	81.2	70.6	81.2	70.6	81.2	60.4	7490	85.5
1976	2548.1	350.0	83.5	72.4	83.5	72.4	82.9	63.5	7530	85.7
1977	2596.3	350.0	85.2	73.9	85.2	73.9	84.7	66.1	7592	86.7
1978	2761.9	350.0	89.5	75.6	89.5	75.6	90.1	68.7	8031	91.7
1979	2658.8	350.0	86.1	76.6	86.1	76.6	86.7	70.5	7746	88.4
1980	2650.5	350.0	85.7	77.4	85.7	77.4	86.2	71.9	7682	87.5
1981	2569.7	350.0	83.5	77.9	83.5	77.9	83.8	72.8	7486	85.5
1982	2566.9	350.0	83.5	78.4	83.5	78.4	83.7	73.7	7553	86.2
1983	2551.7	350.0	83.5	78.7	83.5	78.7	83.2	74.3	7546	86.1
1984	2732.9	350.0	88.8	79.4	88.8	79.4	88.9	75.3	8001	91.1
1985	2634.3	350.0	86.0	79.8	86.0	79.8	85.9	76.0	7906	90.3
1986	2496.3	350.0	81.6	79.9	81.6	79.9	81.4	76.3	7403	84.5
1987	2486.3	350.0	80.7	79.9	80.7	79.9	81.1	76.5	7256	82.8
1988	2566.5	350.0	83.0	80.1	83.0	80.1	83.5	76.9	7499	85.4
1989	2433.1	350.0	78.6	80.0	78.6	80.0	79.4	77.0	7062	80.6
1990	2562.5	350.0	84.4	80.2	84.4	80.2	83.6	77.3	7506	85.7
1991	2495.3	350.0	83.5	80.4	83.5	80.4	81.4	77.5	7430	84.8
1992	2477.4	350.0	81.7	80.4	81.7	80.4	80.6	77.6	7303	83.1
1993	2158.4	350.0	69.9	80.0	69.4	80.0	70.4	77.3	6241	71.2
1994	2686.9	350.0	86.2	80.2	85.1	80.2	87.6	77.8	7610	86.9
1995	2850.5	350.0	90.5	80.6	90.2	80.6	93.0	78.3	7993	91.2
1996	2753.2	353.0	87.5	80.9	86.8	80.8	88.6	78.7	7704	87.7
1997	2708.2	365.0	87.5	81.1	85.1	81.0	84.7	78.9	7731	88.3
1998	3183.1	365.0	99.9	81.8	99.8	81.6	99.6	79.7	8760	100.0
1999	2841.3	365.0	91.3	82.1	88.6	81.9	88.9	80.0	8074	92.2
2000	2539.2	365.0	79.2	82.0	78.3	81.7	79.2	80.0	7113	81.0
2001	3090.2	365.0	96.8	82.5	96.8	82.2	96.6	80.5	8504	97.1
2002	2908.8	365.0	91.3	82.8	91.0	82.5	91.0	80.8	8000	91.3
2003	3061.8	365.0	96.9	83.2	96.2	82.9	95.8	81.3	8494	97.0
2004	2801.2	365.0	87.5	83.3	87.4	83.0	87.4	81.4	7758	88.3
2005	3096.0	365.0	96.7	83.7	96.6	83.4	96.8	81.9	8491	96.9
2006	2950.7	365.0	92.3	83.9	92.2	83.7	92.3	82.2	8114	92.6
2007	3081.3	365.0	96.7	84.3	96.7	84.0	96.4	82.6	8486	96.9
2008	2956.6	365.0	92.4	84.5	92.4	84.2	92.5	82.8	8143	93.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		6			233	
B. Refuelling without a maintenance				23		
C. Inspection, maintenance or repair combined with refuelling	629			922		
D. Inspection, maintenance or repair without refuelling				17		
E. Testing of plant systems or component:					0	
Subtotal	629	6	0	962	233	0
Total		635			1195	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems		93
13. Reactor Auxiliary Systems		2
14. Safety Systems		3
15. Reactor Cooling System:		11
16. Steam generation system:		91
31. Turbine and auxiliaries	6	1
32. Feedwater and Main Steam System		12
35. All other I&C Systems		0
Total	6	229

## CH-3 BEZNAU-2

**Operator:** NOK (NORDOSTSCHWEIZERISCHE KRAFTWERKE)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3073.4 GW(e).h  
**Energy Availability Factor:** 96.2%  
**Load Factor:** 96.1%  
**Operating Factor:** 97.1%  
**Energy Unavailability Factor:** 3.8%  
**Total Off-line Time:** 255 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	268.1	254.8	272.2	258.4	270.8	259.5	266.2	156.4	260.2	271.6	262.4	272.6	3073.4
<b>EAF (%)</b>	98.4	100.0	100.0	98.1	100.0	100.0	100.0	59.4	100.0	100.0	99.7	100.0	96.2
<b>UCF (%)</b>	98.4	100.0	100.0	98.2	100.0	100.0	100.0	59.4	100.0	100.0	99.7	100.0	96.2
<b>LF (%)</b>	98.7	103.9	100.2	98.5	99.7	98.8	98.0	57.6	99.0	99.9	99.9	100.4	96.1
<b>OF (%)</b>	98.8	103.6	99.9	100.1	100.0	100.0	100.0	63.7	100.0	100.0	100.0	100.0	97.1
<b>EUF (%)</b>	1.6	0.0	0.0	1.9	0.0	0.0	0.0	40.6	0.0	0.0	0.3	0.0	3.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.4	0.0	0.0	0.0	0.0	3.3
<b>UCLF (%)</b>	1.6	0.0	0.0	1.9	0.0	0.0	0.0	2.3	0.0	0.0	0.3	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. 2008 Summary of Operation

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## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jan 1968	<b>Lifetime Generation:</b>	100764.4 GW(e).h
<b>Date of First Criticality:</b>	16 Oct 1971	<b>Cumulative Energy Availability Factor:</b>	87.2%
<b>Date of Grid Connection:</b>	23 Oct 1971	<b>Cumulative Load Factor:</b>	87.5%
<b>Date of Commercial Operation:</b>	01 Dec 1971	<b>Cumulative Unit Capability Factor:</b>	87.3%
		<b>Cumulative Energy Unavailability Factor:</b>	12.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1971	174.9	340.0	94.6	94.6	94.6	94.6	80.8	80.8	690	92.7
1972	2618.5	364.0	82.7	83.5	82.7	83.5	81.9	81.8	7624	86.8
1973	2220.7	350.0	78.4	81.1	78.4	81.1	72.4	77.4	7042	80.4
1974	2527.8	350.0	83.5	81.9	83.5	81.9	82.4	79.0	7607	86.8
1975	2547.0	350.0	83.1	82.2	83.1	82.2	83.1	80.0	7503	85.7
1976	2652.2	350.0	86.6	83.0	86.6	83.0	86.3	81.2	7777	88.5
1977	2690.9	350.0	85.6	83.4	85.6	83.4	87.8	82.3	7758	88.6
1978	2753.1	350.0	86.7	83.9	86.7	83.9	89.8	83.3	7888	90.0
1979	2700.0	350.0	86.7	84.2	86.7	84.2	88.1	83.9	7835	89.4
1980	2559.0	350.0	81.0	83.9	81.0	83.9	83.2	83.9	7279	82.9
1981	2768.8	350.0	88.8	84.4	88.8	84.4	90.3	84.5	7868	89.8
1982	2722.1	350.0	87.6	84.7	87.6	84.7	88.8	84.9	7811	89.2
1983	2790.5	350.0	89.6	85.1	89.6	85.1	91.0	85.4	7977	91.1
1984	2724.2	350.0	87.5	85.3	87.5	85.3	88.6	85.6	7874	89.6
1985	2629.1	350.0	84.9	85.2	84.9	85.2	85.7	85.6	7647	87.3
1986	2769.8	350.0	90.2	85.6	90.2	85.6	90.3	85.9	7983	91.1
1987	2527.6	350.0	82.4	85.4	82.4	85.4	82.4	85.7	7535	86.0
1988	2630.2	350.0	84.5	85.3	84.5	85.3	85.6	85.7	7604	86.6
1989	2643.3	350.0	85.1	85.3	85.1	85.3	86.2	85.7	7614	86.9
1990	2636.1	350.0	85.3	85.3	85.3	85.3	86.0	85.8	7568	86.4
1991	2619.5	350.0	84.5	85.3	84.5	85.3	85.4	85.7	7551	86.2
1992	2375.9	350.0	76.3	84.8	76.3	84.8	77.3	85.3	6836	77.8
1993	2650.9	350.0	85.1	84.8	84.9	84.8	86.5	85.4	7517	85.8
1994	3062.8	350.0	98.9	85.5	98.8	85.4	99.9	86.0	8710	99.4
1995	2560.9	350.0	82.7	85.3	82.6	85.3	83.5	85.9	7247	82.7
1996	2754.1	351.0	88.5	85.5	87.9	85.4	89.1	86.0	7912	90.1
1997	3090.2	357.0	99.5	86.0	99.5	86.0	98.8	86.5	8732	99.7
1998	2717.8	357.0	87.8	86.1	87.3	86.0	86.9	86.6	7755	88.5
1999	2217.2	357.0	70.7	85.5	70.3	85.5	70.9	86.0	6322	72.2
2000	3071.0	365.0	96.2	85.9	96.2	85.8	95.8	86.3	8499	96.8
2001	2568.7	365.0	80.7	85.7	80.7	85.7	80.3	86.1	7107	81.1
2002	3012.0	365.0	94.6	86.0	94.6	86.0	94.2	86.4	8292	94.7
2003	2920.3	365.0	92.0	86.2	91.8	86.1	91.3	86.6	8070	92.1
2004	3099.4	365.0	97.0	86.6	97.0	86.5	96.7	86.9	8556	97.4
2005	2801.0	365.0	88.0	86.6	87.8	86.5	87.6	86.9	7728	88.2
2006	3073.2	365.0	97.1	86.9	96.8	86.8	96.1	87.2	8517	97.2
2007	2911.6	365.0	91.5	87.0	91.5	87.0	91.1	87.3	8063	92.0
2008	3073.4	365.0	96.2	87.3	96.2	87.2	96.1	87.5	8505	97.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		9			83	
B. Refuelling without a maintenance	270			22	1	
C. Inspection, maintenance or repair combined with refuelling				823		
D. Inspection, maintenance or repair without refuelling				37		
J. Grid limitation, failure or grid unavailability						0
L. Human factor related					0	
Subtotal	270	9	0	882	84	0
Total		279			966	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		1
14. Safety Systems		0
15. Reactor Cooling System		9
16. Steam generation system		25
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		14
32. Feedwater and Main Steam System		2
35. All other I&C Systems		1
42. Electrical Power Supply System	9	1
Total	9	66

## CH-4 GOESGEN

**Operator:** KKG (KERNKRAFTWERK GOESGEN-DAENIKEN AG)

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

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 970.0 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 2008

**Net Energy Production:** 7964.0 GW(e).h  
**Energy Availability Factor:** 92.2%  
**Load Factor:** 93.7%  
**Operating Factor:** 93.0%  
**Energy Unavailability Factor:** 7.8%  
**Total Off-line Time:** 612 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	737.3	686.1	733.0	707.5	674.1	85.3	723.0	723.5	706.4	733.5	713.8	740.6	7964.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	92.0	13.1	100.0	100.0	100.0	100.0	100.0	100.0	92.2
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	97.2	13.1	100.0	100.0	100.0	100.0	100.0	100.0	92.6
<b>LF (%)</b>	102.2	105.2	101.6	101.4	93.4	12.2	100.2	100.3	101.1	101.5	102.2	102.6	93.7
<b>OF (%)</b>	100.0	103.6	99.9	100.1	97.4	14.3	100.0	100.0	100.0	100.0	100.0	100.0	93.0
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	8.0	86.9	0.0	0.0	0.0	0.0	0.0	0.0	7.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	2.8	86.9	0.0	0.0	0.0	0.0	0.0	0.0	7.4
<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	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

KKG FINISHED THE 18TH YEAR WITHOUT UNPLANNED SCRAM.FOR MORE THEN 2 YEAARS WE HAD NOW UNPLANNED ENERGY LOSS.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Dec 1973	<b>Lifetime Generation:</b>	217656.1 GW(e).h
<b>Date of First Criticality:</b>	20 Jan 1979	<b>Cumulative Energy Availability Factor:</b>	88.4%
<b>Date of Grid Connection:</b>	02 Feb 1979	<b>Cumulative Load Factor:</b>	88.8%
<b>Date of Commercial Operation:</b>	01 Nov 1979	<b>Cumulative Unit Capability Factor:</b>	89.3%
		<b>Cumulative Energy Unavailability Factor:</b>	11.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	1255.5	924.0	93.2	93.2	93.2	93.2	93.2	93.2	1422	97.1
1980	5935.7	920.0	73.5	76.3	73.5	76.3	73.4	76.3	6819	77.6
1981	6527.6	920.0	80.7	78.3	80.7	78.3	81.0	78.4	7523	85.9
1982	6436.1	920.0	79.8	78.8	79.8	78.8	79.9	78.9	7665	87.5
1983	6891.6	920.0	86.2	80.6	86.2	80.6	85.5	80.5	7790	88.9
1984	7134.8	900.0	90.6	82.5	89.8	82.3	90.2	82.3	8015	91.2
1985	6747.7	909.0	85.7	83.0	84.6	82.7	84.7	82.7	7789	88.9
1986	6754.5	941.0	84.1	83.1	82.8	82.7	81.9	82.6	7386	84.3
1987	6910.3	935.0	85.2	83.4	84.4	82.9	84.4	82.8	7521	85.9
1988	6859.0	936.0	84.7	83.5	83.4	83.0	83.4	82.9	7476	85.1
1989	6878.7	931.0	85.4	83.7	84.3	83.1	84.3	83.0	7514	85.8
1990	7131.5	929.0	89.4	84.2	87.6	83.5	87.6	83.5	7983	91.1
1991	7141.9	925.0	89.7	84.7	88.1	83.9	88.1	83.8	7918	90.4
1992	7406.9	934.0	92.1	85.3	90.2	84.4	90.2	84.3	8107	92.3
1993	7408.1	950.0	89.3	85.5	88.9	84.7	89.0	84.7	8075	92.2
1994	7661.1	947.0	92.1	86.0	91.1	85.1	92.3	85.2	8102	92.5
1995	7820.9	971.0	91.8	86.4	91.1	85.5	91.9	85.6	8109	92.6
1996	7928.4	986.0	93.4	86.8	91.5	85.9	91.5	86.0	8204	93.4
1997	7967.8	986.0	93.5	87.2	91.6	86.2	92.2	86.4	8189	93.5
1998	7839.7	986.0	93.2	87.5	90.8	86.5	90.8	86.6	8179	93.4
1999	7533.9	970.0	89.9	87.6	88.7	86.6	88.7	86.7	7887	90.0
2000	7804.3	970.0	92.0	87.9	91.7	86.8	91.6	86.9	8089	92.1
2001	7870.5	970.0	93.5	88.1	92.6	87.1	92.6	87.2	8206	93.7
2002	7853.3	970.0	92.9	88.3	92.3	87.3	92.4	87.4	8154	93.1
2003	7988.7	970.0	94.5	88.6	93.9	87.6	94.0	87.7	8291	94.6
2004	8015.6	970.0	94.3	88.8	93.8	87.9	94.1	88.0	8300	94.5
2005	7588.2	970.0	88.4	88.8	88.0	87.9	89.3	88.0	7754	88.5
2006	8099.1	970.0	93.7	89.0	93.6	88.1	95.3	88.3	8230	93.9
2007	8158.9	970.0	94.8	89.2	94.6	88.3	96.0	88.6	8313	94.9
2008	7964.0	970.0	92.6	89.3	92.2	88.4	93.7	88.8	8148	93.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1979 to 2008 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	640			760		
E. Testing of plant systems or component:	1				0	
J. Grid limitation, failure or grid unavailability						0
Subtotal	641	0	0	760	34	0
Total		641			794	

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

System	2008 Hours Lost	1979 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		4
16. Steam generation system:		1
31. Turbine and auxiliaries		4
32. Feedwater and Main Steam System		20
41. Main Generator System:		4
Total	0	33

## CH-5 LEIBSTADT

Operator: KKL (KERNKRAFTWERK LEIBSTADT)

Contractor: GETSCO (GENERAL ELECTRIC TECHNICAL SERVICES CO.)

### 1. Station Details

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 1165.0 MW(e)

Design Net Capacity: 942.0 MW(e)

Design Discharge Burnup: 43000 MW.d/t

Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 9307.6 GW(e).h

Energy Availability Factor: 90.7%

Load Factor: 91.2%

Operating Factor: 92.7%

Energy Unavailability Factor: 9.3%

Total Off-line Time: 641 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	871.5	815.3	862.2	837.9	850.3	809.7	809.4	47.6	825.9	863.2	840.3	874.4	9307.6
EAF (%)	99.8	100.0	99.2	100.0	98.1	96.5	93.4	5.5	98.5	99.5	99.8	100.0	90.7
UCF (%)	99.8	100.0	99.2	100.0	99.7	99.9	100.0	5.9	99.6	100.0	99.8	100.0	91.8
LF (%)	100.5	104.1	99.5	100.0	98.1	96.5	93.4	5.5	98.5	99.5	100.2	100.9	91.2
OF (%)	100.0	103.6	99.9	100.1	100.0	100.0	100.0	10.6	100.0	100.0	100.0	100.0	92.7
EUf (%)	0.2	0.0	0.8	0.0	1.9	3.5	6.6	94.5	1.5	0.5	0.2	0.0	9.3
PUF (%)	0.2	0.0	0.1	0.0	0.2	0.1	0.0	94.1	0.4	0.0	0.2	0.0	8.1
UCLF (%)	0.0	0.0	0.7	0.0	0.1	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	1.6	3.3	6.6	0.4	1.1	0.5	0.0	0.0	1.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

COASTDOWN OPERATION FROM JULY 4TH UNTIL AUGUST 2ND.ANNUAL REFUELING OUTAGE FROM AUGUST 2ND UNTIL AUGUST 30TH.

### 5. Historical Summary

Date of Construction Start: 01 Jan 1974      Lifetime Generation: 192836.0 GW(e).h

Date of First Criticality: 09 Mar 1984      Cumulative Energy Availability Factor: 85.3%

Date of Grid Connection: 24 May 1984      Cumulative Load Factor: 81.4%

Date of Commercial Operation: 15 Dec 1984      Cumulative Unit Capability Factor: 87.0%

   Cumulative Energy Unavailability Factor: 14.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	0.0	1030.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1985	6769.3	951.0	80.1	81.8	80.1	81.8	81.2	74.4	7233	82.6
1986	7209.2	957.0	83.2	82.5	83.2	82.5	85.9	79.9	7668	87.5
1987	7376.4	990.0	85.2	83.4	85.2	83.4	85.1	81.6	7917	90.4
1988	7003.5	990.0	80.0	82.5	80.0	82.5	80.5	81.4	7536	85.8
1989	7364.2	990.0	85.5	83.1	85.5	83.1	84.9	82.1	7671	87.6
1990	7596.2	990.0	89.9	84.3	89.9	84.3	87.6	83.0	7905	90.2
1991	7060.3	990.0	86.0	84.5	81.3	83.8	81.4	82.8	7580	86.5
1992	7537.6	990.0	90.4	85.2	86.4	84.2	86.7	83.2	7986	90.9
1993	7338.1	990.0	89.1	85.7	84.4	84.2	84.6	83.4	7898	90.2
1994	6988.2	1003.0	81.4	85.2	79.4	83.7	79.5	83.0	7108	81.1
1995	7673.8	1030.0	89.1	85.6	84.2	83.7	85.0	83.2	7819	89.3
1996	7705.1	1030.0	87.6	85.8	84.8	83.8	85.2	83.4	7734	88.0
1997	7762.5	1030.0	89.2	86.0	86.2	84.0	86.0	83.6	7830	89.4
1998	8046.2	1030.0	92.4	86.5	88.2	84.3	89.2	84.0	8102	92.5
1999	8320.0	1080.0	91.8	86.9	86.8	84.5	87.9	84.3	8126	92.8
2000	8823.2	1115.0	92.3	87.3	89.5	84.8	90.1	84.7	8159	92.9
2001	9.1	1145.0	91.2	87.5	90.4	85.2	0.1	79.2	8188	93.5
2002	9173.8	1115.0	91.5	87.7	90.8	85.5	93.9	80.1	8250	94.2
2003	9309.3	1165.0	90.9	87.9	90.1	85.8	91.2	80.8	8204	93.6
2004	8692.0	1165.0	85.7	87.8	84.9	85.8	84.9	81.0	7633	86.9
2005	5768.1	1165.0	56.5	86.2	56.3	84.2	56.5	79.7	5004	57.1
2006	9367.0	1165.0	92.7	86.5	91.7	84.6	91.8	80.3	8206	93.7
2007	9436.8	1165.0	93.4	86.8	93.2	85.0	92.5	80.9	8276	94.5
2008	9307.6	1165.0	91.8	87.0	90.7	85.3	91.2	81.4	8119	92.7



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				0	195	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	665			710		
D. Inspection, maintenance or repair without refuelling				18		
E. Testing of plant systems or component				0	1	
H. Nuclear regulatory requirement						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				2		
L. Human factor related					4	
Subtotal	665	0	0	730	203	1
Total	665			934		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		2
15. Reactor Cooling System		4
31. Turbine and auxiliaries		14
32. Feedwater and Main Steam System		7
35. All other I&C Systems		3
41. Main Generator System		158
XX. Miscellaneous Systems		0
Total	0	190

## CH-2 MUEHLEBERG

**Operator:** BKW (BKW ENERGIE AG)

**Contractor:** GETSCO (GENERAL ELECTRIC TECHNICAL SERVICES CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 355.0 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 2008

**Net Energy Production:** 2973.3 GW(e).h  
**Energy Availability Factor:** 91.3%  
**Load Factor:** 95.3%  
**Operating Factor:** 92.4%  
**Energy Unavailability Factor:** 8.7%  
**Total Off-line Time:** 671 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	276.5	258.0	275.5	264.6	273.2	257.7	267.2	70.3	204.7	280.7	262.8	282.1	2973.3
<b>EAF (%)</b>	100.0	99.8	100.0	99.3	99.8	98.0	98.9	28.8	75.6	99.9	96.2	99.9	91.3
<b>UCF (%)</b>	100.0	99.8	100.0	99.3	99.8	98.2	100.0	29.3	75.6	99.9	96.2	99.9	91.4
<b>LF (%)</b>	104.7	104.4	104.3	103.5	103.4	100.8	101.2	26.6	80.1	106.1	102.8	106.8	95.3
<b>OF (%)</b>	100.0	100.0	99.9	100.0	100.0	100.0	100.0	29.3	80.8	100.0	99.2	100.0	92.4
<b>EUF (%)</b>	0.0	0.2	0.0	0.7	0.2	2.0	1.1	71.2	24.4	0.1	3.8	0.1	8.7
<b>PUF (%)</b>	0.0	0.2	0.0	0.7	0.2	0.0	0.0	70.7	24.4	0.1	3.0	0.1	8.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.8	0.0	0.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.2	1.0	0.5	0.0	0.0	0.0	0.0	0.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

NORMAL OPERATION WITHOUT ANY MAYOR PROBLEMS. FROM JANUARY 15 TO 25 AN ON-LINE NOBLE METAL CHEMICAL APPLICATION WAS PERFORMED TO PROTECT REACTOR PRESSURE VESSEL INTERNALS. BESIDE JUNE 12 AND NOVEMBER 15 THE PLANT OPERATED WITH FULL LOAD EXCEPT FOR A FEW LOAD REDUCTIONS TO CARRY OUT SURVEILLANCE TESTS, ROD PATTERN CHANGES AS WELL AS MINOR REPAIRS. ON JUNE 12 A TURBINE TRIP OF TRAIN A AND AN AUTOMATIC POWER REDUCTION OCCURED . THE REASON WAS A MALFUNCTION OF A COMPONENT FOR THE TURBINE SPEED CONTROL. FROM AUGUST 10 TO SEPTEMBER 6 THE ANNUAL REFUELING AND MAINTENANCE OUTAGE TOOK PLACE. DURING A PLANNED ROD SCRAM TIME TEST ON NOVEMBER 15 A REACTOR SCRAM TOOK PLACE. THE CAUSE WAS A DELAYED RESETING OF THE TESTING MODE. DURING THE WHOLE YEAR THE HYDROGEN INJECTION WAS IN SERVICE

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Mar 1967	<b>Lifetime Generation:</b>	90089.1 GW(e).h
<b>Date of First Criticality:</b>	08 Mar 1971	<b>Cumulative Energy Availability Factor:</b>	86.4%
<b>Date of Grid Connection:</b>	01 Jul 1971	<b>Cumulative Load Factor:</b>	87.0%
<b>Date of Commercial Operation:</b>	06 Nov 1972	<b>Cumulative Unit Capability Factor:</b>	87.6%
		<b>Cumulative Energy Unavailability Factor:</b>	13.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	387.9	323.0	92.2	92.2	92.2	92.2	82.0	82.0	1334	91.1
1973	2011.6	306.0	80.7	82.4	80.7	82.4	75.0	76.1	7315	83.5
1974	1846.2	306.0	73.2	78.2	73.2	78.2	68.9	72.8	7062	80.6
1975	2344.1	306.0	87.1	81.0	87.1	81.0	87.4	77.4	7989	91.2
1976	2355.2	306.0	85.2	82.0	85.2	82.0	87.6	79.8	7960	90.6
1977	2429.3	320.0	85.7	82.7	85.7	82.7	86.7	81.2	8097	92.4
1978	2465.7	320.0	87.3	83.5	87.3	83.5	88.0	82.3	8001	91.3
1979	2473.9	320.0	87.7	84.1	87.7	84.1	88.3	83.2	8024	91.6
1980	2482.4	320.0	88.5	84.6	88.5	84.6	88.3	83.8	8005	91.1
1981	2539.0	324.0	89.1	85.2	89.1	85.2	89.5	84.5	8051	91.9
1982	2663.3	326.0	88.9	85.5	88.9	85.5	93.3	85.4	8017	91.5
1983	2564.3	326.0	89.6	85.9	89.6	85.9	89.8	85.8	8026	91.6
1984	2527.2	326.0	88.1	86.1	88.1	86.1	88.3	86.0	7989	90.9
1985	2500.7	323.0	87.3	86.2	87.2	86.2	88.2	86.1	7882	90.0
1986	2114.5	326.0	73.7	85.3	73.7	85.3	74.0	85.3	6645	75.9
1987	2465.0	326.0	85.5	85.3	85.5	85.3	86.3	85.3	7959	90.9
1988	2497.6	326.0	87.1	85.4	87.1	85.4	87.2	85.5	7968	90.7
1989	2297.5	323.0	81.3	85.2	81.3	85.2	81.0	85.2	7226	82.5
1990	2477.9	324.0	86.5	85.2	86.5	85.2	87.3	85.3	7910	90.3
1991	2415.1	323.0	87.3	85.4	84.8	85.2	85.4	85.3	7714	88.1
1992	2413.5	323.0	85.0	85.3	85.0	85.2	85.1	85.3	7755	88.3
1993	2568.5	338.0	88.5	85.5	86.8	85.3	86.5	85.4	7917	90.4
1994	2643.1	355.0	89.3	85.7	84.9	85.3	85.0	85.3	7952	90.8
1995	2669.0	355.0	87.8	85.8	85.4	85.3	85.8	85.4	7894	90.1
1996	2649.0	355.0	87.7	85.9	84.4	85.2	85.0	85.3	7847	89.3
1997	2549.2	355.0	86.9	85.9	81.8	85.1	82.0	85.2	7671	87.6
1998	2659.7	355.0	86.5	85.9	85.2	85.1	85.5	85.2	7886	90.0
1999	2702.8	355.0	87.2	86.0	86.6	85.1	86.9	85.3	8064	92.1
2000	2817.0	355.0	93.5	86.3	90.1	85.3	90.3	85.5	8290	94.4
2001	2768.7	355.0	93.3	86.5	88.8	85.5	89.0	85.6	8195	93.6
2002	2828.2	355.0	91.4	86.7	87.7	85.5	90.9	85.8	8280	94.5
2003	2744.2	355.0	89.6	86.8	87.7	85.6	88.2	85.9	8034	91.7
2004	2906.1	355.0	93.3	87.0	92.4	85.8	93.2	86.1	8282	94.3
2005	2855.3	355.0	92.7	87.2	91.0	86.0	91.8	86.3	8130	92.8
2006	2882.9	355.0	92.7	87.4	90.9	86.2	92.7	86.5	8174	93.3
2007	2900.4	355.0	90.6	87.5	90.5	86.3	93.3	86.7	8021	91.6
2008	2973.3	355.0	91.4	87.6	91.3	86.4	95.3	87.0	8114	92.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		6			172	
B. Refuelling without a maintenance outage					1	
C. Inspection, maintenance or repair combined with refuelling	664			759		
D. Inspection, maintenance or repair without refuelling				21		
E. Testing of plant systems or component				2		
H. Nuclear regulatory requirement					0	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					2	0
Subtotal	664	6	0	782	175	1
Total		670			958	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		0
14. Safety Systems		2
15. Reactor Cooling System		1
17. Safety I&C Systems (excluding reactor I&C)	6	0
31. Turbine and auxiliaries		158
32. Feedwater and Main Steam System		1
35. All other I&C Systems		0
42. Electrical Power Supply System		0
Total	6	169

## UA-40 KHMELNITSKI-1

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6547.2 GW(e).h  
**Energy Availability Factor:** 81.3%  
**Load Factor:** 78.7%  
**Operating Factor:** 82.6%  
**Energy Unavailability Factor:** 18.7%  
**Total Off-line Time:** 1523 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	715.6	671.6	568.5	617.4	707.1	368.3	0.0	182.1	693.4	719.9	587.0	716.3	6547.2
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	99.7	54.7	0.0	26.9	100.0	100.0	96.5	100.0	81.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	66.3	0.0	26.9	100.0	100.0	96.5	100.0	82.2
<b>LF (%)</b>	101.2	105.2	80.4	90.4	100.0	53.9	0.0	25.8	101.4	101.7	85.8	101.3	78.7
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	66.5	0.0	27.8	100.0	100.0	96.5	100.0	82.6
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.3	45.3	100.0	73.1	0.0	0.0	3.5	0.0	18.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	33.7	100.0	73.1	0.0	0.0	0.0	0.0	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	3.5	0.0	0.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.3	11.6	0.0	0.0	0.0	0.0	0.0	0.0	1.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION=283GW(E)HMAJOR ACHIEVEMENTS LEADING TO INCREASED AVAILABILITY: RECONSTRUCTION OF BALL CLEANING SYSTEM TAPPROGE FOR MAIN CONDENSER AND TURBINE DRIVER FEEDWATER PUMP CONDENSER

### 5. Historical Summary

**Date of Construction Start:** 01 Nov 1981 **Lifetime Generation:** 119487.0 GW(e).h  
**Date of First Criticality:** 10 Dec 1987 **Cumulative Energy Availability Factor:** 72.9%  
**Date of Grid Connection:** 31 Dec 1987 **Cumulative Load Factor:** 73.0%  
**Date of Commercial Operation:** 13 Aug 1988 **Cumulative Unit Capability Factor:** 73.8%  
**Cumulative Energy Unavailability Factor:** 27.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	2133.1	950.0	67.1	67.1	67.1	67.1	61.1	61.1	2753	75.0
1989	5872.3	950.0	70.7	69.6	70.6	69.6	70.6	67.8	6295	71.9
1990	6498.6	950.0	77.4	72.8	77.4	72.8	78.1	72.0	6870	78.4
1991	5172.5	950.0	61.2	69.4	61.2	69.4	62.2	69.1	5551	63.4
1992	6075.1	950.0	67.6	69.0	66.5	68.8	72.8	70.0	6167	70.2
1993	5487.7	950.0	65.2	68.3	65.2	68.1	65.9	69.2	5782	66.0
1994	6303.4	950.0	76.0	69.5	75.5	69.3	75.7	70.2	6775	77.3
1995	5700.3	950.0	68.0	69.3	68.0	69.1	68.5	70.0	6014	68.7
1996	4497.9	950.0	54.2	67.5	53.9	67.3	53.9	68.1	4854	55.3
1997	6152.1	950.0	72.8	68.1	72.6	67.8	73.9	68.7	6415	73.2
1998	5499.2	950.0	67.1	68.0	65.8	67.6	66.1	68.5	5904	67.4
1999	5526.7	950.0	66.8	67.9	66.4	67.5	66.4	68.3	6506	74.3
2000	5899.6	950.0	74.3	68.4	70.4	67.8	70.7	68.5	6541	74.5
2001	6167.3	950.0	76.5	69.0	73.6	68.2	73.9	68.9	6781	77.2
2002	6730.5	950.0	80.3	69.8	79.9	69.0	80.9	69.7	7049	80.5
2003	7137.7	950.0	85.4	70.8	84.9	70.0	85.8	70.8	7512	85.8
2004	6325.1	950.0	80.9	71.4	75.4	70.4	75.8	71.1	6935	79.0
2005	6862.8	950.0	84.9	72.2	84.8	71.2	82.5	71.7	7433	84.9
2006	6684.9	950.0	83.9	72.8	83.5	71.9	80.3	72.2	7407	84.6
2007	6905.3	950.0	83.1	73.3	83.0	72.4	83.0	72.7	7297	83.3
2008	6547.2	950.0	82.2	73.8	81.3	72.9	78.7	73.0	7237	82.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		25			226	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	1522			1566		
D. Inspection, maintenance or repair without refuelling				220		
E. Testing of plant systems or component				17		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	9
Subtotal	1522	25	0	1803	232	9
Total		1547			2044	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	25	27
13. Reactor Auxiliary System:		12
14. Safety Systems		0
15. Reactor Cooling System:		24
16. Steam generation system:		0
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries:		25
32. Feedwater and Main Steam System		14
35. All other I&C Systems:		0
41. Main Generator System:		111
42. Electrical Power Supply System:		5
Total	25	221

## UA-41 KHMELNITSKI-2

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 4944.8 GW(e).h  
**Energy Availability Factor:** 59.5%  
**Load Factor:** 59.4%  
**Operating Factor:** 60.1%  
**Energy Unavailability Factor:** 40.5%  
**Total Off-line Time:** 3497 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	357.8	725.8	702.8	719.2	477.7	0.0	0.0	105.4	489.8	641.2	725.2	4944.8
<b>EAF (%)</b>	0.0	52.4	100.0	100.0	100.0	70.3	0.0	0.0	16.2	76.4	100.0	100.0	59.5
<b>UCF (%)</b>	0.0	52.4	100.0	100.0	100.0	70.8	0.0	0.0	16.2	76.4	100.0	100.0	59.6
<b>LF (%)</b>	0.0	56.0	102.7	102.9	101.7	69.8	0.0	0.0	15.4	69.2	93.7	102.6	59.4
<b>OF (%)</b>	0.0	57.3	99.9	100.1	100.0	70.8	0.0	0.0	17.1	77.0	100.0	100.0	60.1
<b>EUF (%)</b>	100.0	47.6	0.0	0.0	0.0	29.7	100.0	100.0	83.8	23.6	0.0	0.0	40.5
<b>PUF (%)</b>	100.0	47.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.6	0.0	0.0	14.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	29.2	100.0	100.0	83.8	0.0	0.0	0.0	26.3
<b>XUF (%)</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

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE ENERGY LOSSES DUE TO EXTERNAL CAUSES: TRANSMISSION LINE LIMITATION=106GW(E)HMAJOR ACHIEVEMENTS LEADING TO INCREASED AVAILABILITY: USING OF PROTECTIVE COATING FOR MAIN CONDENSER TUBE SHEETROTOR REPLACEMENT

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Feb 1985	<b>Lifetime Generation:</b>	26490.0 GW(e).h
<b>Date of First Criticality:</b>	01 Aug 2004	<b>Cumulative Energy Availability Factor:</b>	78.9%
<b>Date of Grid Connection:</b>	07 Aug 2004	<b>Cumulative Load Factor:</b>	76.3%
<b>Date of Commercial Operation:</b>	15 Dec 2005	<b>Cumulative Unit Capability Factor:</b>	80.0%
		<b>Cumulative Energy Unavailability Factor:</b>	21.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2005	261.4	950.0	100.0	100.0	100.0	100.0	37.0	37.0	296	39.8
2006	7178.3	950.0	87.4	88.4	86.2	87.2	86.3	82.4	7697	87.9
2007	7213.4	950.0	91.2	89.7	89.1	88.1	86.7	84.5	8008	91.4
2008	4944.8	950.0	59.6	80.0	59.5	78.9	59.4	76.3	5263	60.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2006 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2295			29	
C. Inspection, maintenance or repair combined with refuelling	1055			523		
D. Inspection, maintenance or repair without refuelling	172			53		
Subtotal	1227	2295	0	576	29	0
Total		3522			605	

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

System	2008 Hours Lost	2006 to 2008 Average Hours Lost Per Year
14. Safety Systems		23
31. Turbine and auxiliaries		5
32. Feedwater and Main Steam System		0
41. Main Generator System	2295	
Total	2295	28



## UA-27 ROVNO-1

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2445.7 GW(e).h  
**Energy Availability Factor:** 75.5%  
**Load Factor:** 73.3%  
**Operating Factor:** 77.8%  
**Energy Unavailability Factor:** 24.5%  
**Total Off-line Time:** 1945 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	300.8	246.2	221.1	226.9	284.3	272.7	277.9	275.5	257.6	82.8	0.0	0.0	2445.7
<b>EAF (%)</b>	98.8	98.0	99.6	94.9	99.1	98.3	97.5	96.6	95.4	30.1	0.0	0.0	75.5
<b>UCF (%)</b>	98.8	98.0	99.6	94.9	99.4	99.6	98.8	98.6	95.8	32.2	0.0	0.0	76.2
<b>LF (%)</b>	106.1	96.2	78.0	82.8	100.3	99.4	98.0	97.2	93.9	29.2	0.0	0.0	73.3
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	32.2	0.0	0.0	77.8
<b>EUf (%)</b>	1.2	2.0	0.4	5.1	0.9	1.7	2.5	3.4	4.6	69.9	100.0	100.0	24.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.8	100.0	100.0	22.5
<b>UCLF (%)</b>	1.2	2.0	0.4	5.1	0.6	0.4	1.2	1.4	4.2	0.0	0.0	0.0	1.4
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.4	1.2	1.4	1.9	0.4	2.1	0.0	0.0	0.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE ENERGY LOSSES DUE TO CONDENSER PROBLEM: 22 GW(E)H AND EXTERNAL CAUSES: LIMITATION DUE TO POWER DISTRIBUTION CIRCUIT =125GW(E)H.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Aug 1973	<b>Lifetime Generation:</b>	71557.0 GW(e).h
<b>Date of First Criticality:</b>	17 Dec 1980	<b>Cumulative Energy Availability Factor:</b>	79.9%
<b>Date of Grid Connection:</b>	31 Dec 1980	<b>Cumulative Load Factor:</b>	79.5%
<b>Date of Commercial Operation:</b>	21 Sep 1981	<b>Cumulative Unit Capability Factor:</b>	80.6%
		<b>Cumulative Energy Unavailability Factor:</b>	20.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	932.3	361.0	91.0	91.0	91.0	91.0	88.2	88.2	2924	99.9
1982	1725.2	361.0	51.9	61.7	51.9	61.7	54.6	63.0	5498	62.8
1983	2036.6	361.0	61.6	61.7	61.6	61.7	64.4	63.6	6752	77.1
1984	2686.3	361.0	82.5	67.9	82.5	67.9	84.7	69.9	7782	88.6
1985	2664.8	365.0	81.4	71.1	81.4	71.1	83.3	73.1	7636	87.2
1986	2712.7	361.0	77.5	72.3	77.5	72.3	85.8	75.4	7606	86.8
1987	3040.8	402.0	86.6	74.7	86.6	74.7	86.3	77.3	7756	88.5
1988	2718.0	361.0	86.0	76.3	86.0	76.3	85.7	78.4	7877	89.7
1989	2823.8	361.0	89.2	77.8	89.2	77.8	89.3	79.7	7994	91.3
1990	2590.6	361.0	79.3	77.9	79.3	77.9	81.9	80.0	7265	82.9
1991	2640.1	361.0	81.4	78.3	81.4	78.3	83.5	80.3	7430	84.8
1992	3082.9	403.0	88.5	79.3	87.3	79.1	87.0	80.9	7989	90.9
1993	2584.4	406.0	83.0	79.6	81.4	79.3	72.7	80.2	7159	81.7
1994	2578.6	361.0	81.7	79.7	81.7	79.5	81.5	80.3	7378	84.2
1995	2747.4	361.0	88.4	80.3	86.1	80.0	86.9	80.8	7756	88.5
1996	2432.0	361.0	79.0	80.2	76.7	79.8	76.7	80.5	6960	79.2
1997	2701.1	361.0	82.2	80.4	81.6	79.9	85.4	80.8	7867	89.8
1998	2612.9	361.0	78.1	80.2	77.8	79.7	82.6	80.9	6912	78.9
1999	2240.5	361.0	82.8	80.4	82.8	79.9	70.8	80.4	6214	70.9
2000	2733.7	361.0	85.7	80.6	82.6	80.1	86.2	80.7	7580	86.3
2001	2753.8	381.0	82.6	80.7	81.4	80.1	82.3	80.7	7369	83.9
2002	2656.2	381.0	81.0	80.8	79.9	80.1	79.6	80.7	7242	82.7
2003	2816.1	381.0	84.5	80.9	83.5	80.3	84.4	80.9	7560	86.3
2004	2876.6	381.0	87.9	81.2	86.5	80.5	86.0	81.1	7914	90.1
2005	2362.6	381.0	85.8	81.4	84.5	80.7	70.8	80.6	7753	88.5
2006	2493.6	381.0	78.4	81.3	78.0	80.6	74.7	80.4	7012	80.0
2007	2079.0	381.0	66.3	80.7	65.7	80.0	62.3	79.7	5882	67.1
2008	2445.7	381.0	76.2	80.6	75.5	79.9	73.3	79.5	6815	77.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					49	
C. Inspection, maintenance or repair combined with refuelling	1967			1071		
D. Inspection, maintenance or repair without refuelling				122	1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						0
L. Human factor related					1	
Subtotal	1967	0	0	1193	51	0
Total	1967			1244		

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		3
14. Safety Systems		0
15. Reactor Cooling Systems		14
16. Steam generation system		8
32. Feedwater and Main Steam System		0
35. All other I&C Systems		0
41. Main Generator Systems		3
42. Electrical Power Supply Systems		6
Total	0	45

# UA-28 ROVNO-2

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2650.3 GW(e).h  
**Energy Availability Factor:** 80.9%  
**Load Factor:** 80.5%  
**Operating Factor:** 82.2%  
**Energy Unavailability Factor:** 19.1%  
**Total Off-line Time:** 1557 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	300.5	168.1	267.1	258.4	245.5	217.0	277.1	275.9	270.4	223.9	146.4	0.0	2650.3
<b>EAF (%)</b>	99.1	75.9	99.5	99.8	89.4	80.0	97.8	97.4	99.0	79.7	53.5	0.0	80.9
<b>UCF (%)</b>	99.1	75.9	99.5	99.8	90.2	80.5	99.6	99.8	99.1	79.8	53.5	0.0	81.4
<b>LF (%)</b>	107.4	66.5	95.5	95.6	87.8	80.2	99.1	98.6	99.9	79.9	54.1	0.0	80.5
<b>OF (%)</b>	100.0	80.5	99.9	100.1	90.6	81.1	100.0	100.0	100.0	80.5	54.0	0.0	82.2
<b>EUf (%)</b>	0.9	24.1	0.5	0.2	10.6	20.0	2.2	2.6	1.0	20.3	46.5	100.0	19.1
<b>PUf (%)</b>	0.0	23.7	0.0	0.0	9.4	11.7	0.0	0.0	0.0	19.5	46.2	100.0	17.5
<b>UCLF (%)</b>	1.0	0.5	0.5	0.2	0.4	7.9	0.4	0.2	0.9	0.8	0.2	0.0	1.1
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.8	0.5	1.9	2.4	0.2	0.1	0.0	0.0	0.5

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 01 Oct 1973      **Lifetime Generation:** 70879.0 GW(e).h  
**Date of First Criticality:** 19 Dec 1981      **Cumulative Energy Availability Factor:** 80.1%  
**Date of Grid Connection:** 30 Dec 1981      **Cumulative Load Factor:** 79.2%  
**Date of Commercial Operation:** 30 Jul 1982      **Cumulative Unit Capability Factor:** 81.2%  
**Cumulative Energy Unavailability Factor:** 19.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1982	1397.2	384.0	90.8	90.8	90.8	90.8	82.4	82.4	4403	99.7
1983	1926.9	384.0	58.0	69.0	58.0	69.0	57.3	65.7	5572	63.6
1984	2808.2	384.0	83.1	74.6	83.1	74.6	83.3	72.7	7884	89.8
1985	2913.5	384.0	86.0	77.9	86.0	77.9	86.6	76.7	7994	91.3
1986	2891.8	384.0	83.0	79.0	83.0	79.0	86.0	78.7	7819	89.3
1987	3166.4	416.0	86.3	80.4	86.3	80.4	86.9	80.3	7649	87.3
1988	2778.3	384.0	85.8	81.2	85.8	81.2	82.4	80.6	7875	89.7
1989	2700.4	384.0	86.3	81.9	86.3	81.9	80.3	80.6	7989	91.2
1990	2799.0	384.0	83.1	82.0	83.1	82.0	83.2	80.9	7815	89.2
1991	2393.2	384.0	71.0	80.9	71.0	80.9	71.1	79.9	6560	74.9
1992	2983.7	416.0	83.8	81.2	82.9	81.1	81.7	80.1	7487	85.2
1993	2053.7	406.0	66.0	79.8	64.4	79.6	57.7	78.0	5981	68.3
1994	2690.7	384.0	83.1	80.1	83.1	79.9	80.0	78.2	7626	87.1
1995	2568.5	384.0	79.6	80.0	76.4	79.6	76.4	78.1	7215	82.4
1996	2783.1	384.0	87.8	80.6	82.5	79.8	82.5	78.4	7905	90.0
1997	2585.6	384.0	77.6	80.4	76.5	79.6	76.9	78.3	6847	78.2
1998	2739.6	384.0	83.2	80.5	81.2	79.7	81.4	78.5	7424	84.7
1999	2543.7	384.0	78.0	80.4	75.5	79.5	75.6	78.3	6958	79.4
2000	2718.2	384.0	84.0	80.6	80.3	79.5	80.6	78.4	7460	84.9
2001	2796.9	376.0	86.6	80.9	83.2	79.7	84.7	78.7	7691	87.6
2002	2861.8	376.0	86.5	81.2	85.7	80.0	86.9	79.1	7756	88.5
2003	2784.2	376.0	82.6	81.2	81.6	80.0	84.5	79.4	7376	84.2
2004	2999.7	376.0	89.4	81.6	88.4	80.4	90.8	79.9	8047	91.6
2005	2549.0	376.0	86.5	81.8	86.0	80.6	77.4	79.8	7527	85.9
2006	2627.5	376.0	84.5	81.9	83.3	80.7	79.8	79.8	7727	88.2
2007	2082.9	376.0	63.7	81.2	62.8	80.1	63.2	79.1	5672	64.7
2008	2650.3	376.0	81.4	81.2	80.9	80.1	80.5	79.2	7203	82.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		54			140	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1055			984		
D. Inspection, maintenance or repair without refuelling	471			124		
E. Testing of plant systems or component:				0		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				40		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.					1	
Subtotal	1526	54	0	1148	141	4
Total	1580			1293		

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		17
13. Reactor Auxiliary System:		2
15. Reactor Cooling System:	54	5
16. Steam generation system:		88
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries:		0
32. Feedwater and Main Steam System		15
41. Main Generator System:		3
42. Electrical Power Supply System:		7
Total	54	137

## UA-29 ROVNO-3

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6279.3 GW(e).h  
**Energy Availability Factor:** 76.8%  
**Load Factor:** 75.5%  
**Operating Factor:** 81.0%  
**Energy Unavailability Factor:** 23.2%  
**Total Off-line Time:** 1663 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	620.1	588.9	627.7	314.6	0.0	101.4	628.2	677.4	651.5	693.8	673.9	701.7	6279.3
<b>EAF (%)</b>	89.5	90.4	90.5	48.5	0.0	17.4	90.8	97.4	97.9	99.5	99.6	99.7	76.8
<b>UCF (%)</b>	89.7	90.9	91.1	48.5	0.0	17.6	92.0	99.3	98.8	99.5	99.6	99.7	77.2
<b>LF (%)</b>	87.7	92.2	88.8	46.1	0.0	14.8	88.9	95.8	95.2	98.0	98.5	99.3	75.5
<b>OF (%)</b>	100.0	103.6	99.9	53.4	0.0	19.3	96.5	100.0	100.0	100.0	100.0	100.0	81.0
<b>EUf (%)</b>	10.5	9.6	9.5	51.5	100.0	82.6	9.2	2.6	2.1	0.5	0.4	0.3	23.2
<b>PUF (%)</b>	10.0	8.8	8.5	51.3	100.0	82.3	0.0	0.0	0.0	0.0	0.0	0.0	21.7
<b>UCLF (%)</b>	0.3	0.3	0.4	0.3	0.0	0.1	8.0	0.7	1.3	0.6	0.4	0.4	1.1
<b>XUF (%)</b>	0.3	0.5	0.5	0.0	0.0	0.2	1.2	1.9	0.8	0.0	0.0	0.0	0.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE ENERGY LOSSES DUE TO CONDENSER PROBLEM: 31 GW(E)H AND EXTERNAL CAUSES: LIMITATION DUE TO POWER DISTRIBUTION CIRCUIT =11GW(E)H.

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1980 **Lifetime Generation:** 124711.0 GW(e).h  
**Date of First Criticality:** 11 Nov 1986 **Cumulative Energy Availability Factor:** 70.8%  
**Date of Grid Connection:** 21 Dec 1986 **Cumulative Load Factor:** 68.6%  
**Date of Commercial Operation:** 16 May 1987 **Cumulative Unit Capability Factor:** 72.6%  
**Cumulative Energy Unavailability Factor:** 29.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	3961.1	1000.0	81.3	81.3	81.3	81.3	67.4	67.4	4474	76.1
1988	5661.3	950.0	71.1	75.3	71.1	75.3	67.8	67.6	6357	72.4
1989	6046.1	950.0	75.1	75.2	75.1	75.2	72.7	69.5	6771	77.3
1990	6360.1	950.0	77.3	75.8	77.3	75.8	76.4	71.4	6981	79.7
1991	5454.8	950.0	66.0	73.7	66.0	73.7	65.5	70.1	5971	68.2
1992	7084.9	1000.0	82.2	75.3	82.2	75.3	80.7	72.1	7323	83.4
1993	6195.1	950.0	76.5	75.5	75.9	75.4	74.4	72.4	6861	78.3
1994	5574.7	950.0	67.7	74.5	67.7	74.4	67.0	71.7	6042	69.0
1995	5018.3	950.0	61.0	72.9	60.3	72.8	60.3	70.4	5500	62.8
1996	5550.9	950.0	66.8	72.3	66.5	72.1	66.5	70.0	6064	69.0
1997	6249.6	950.0	75.9	72.6	74.7	72.4	75.1	70.5	6730	76.8
1998	5603.5	950.0	68.2	72.3	67.3	71.9	67.3	70.2	6036	68.9
1999	5303.5	950.0	72.6	72.3	63.7	71.3	63.7	69.7	6342	72.4
2000	4991.3	950.0	72.4	72.3	59.8	70.5	59.8	69.0	5641	64.2
2001	5783.6	950.0	75.3	72.5	69.6	70.4	69.3	69.0	6387	72.7
2002	5562.6	950.0	69.8	72.3	68.4	70.3	66.8	68.9	6320	72.1
2003	6250.5	950.0	75.2	72.5	74.3	70.5	75.1	69.2	6815	77.8
2004	6693.3	950.0	84.2	73.1	83.2	71.2	80.2	69.9	7321	83.3
2005	4768.1	950.0	69.7	73.0	68.3	71.1	57.3	69.2	6158	70.3
2006	4614.0	950.0	65.6	72.6	64.6	70.7	55.4	68.5	6777	77.4
2007	5317.2	950.0	67.4	72.3	66.8	70.5	63.9	68.3	6622	75.6
2008	6279.3	950.0	77.2	72.6	76.8	70.8	75.5	68.6	7097	81.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		27		78	300	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	1661			1537		
D. Inspection, maintenance or repair without refuelling				132		
E. Testing of plant systems or component				25		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						8
J. Grid limitation, failure or grid unavailability						17
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	34
Subtotal	1661	27	0	1772	311	59
Total		1688			2142	

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		25
12. Reactor I&C Systems		31
13. Reactor Auxiliary System		13
15. Reactor Cooling System		6
16. Steam generation system	27	29
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		3
33. Circulating Water System		1
35. All other I&C Systems		0
41. Main Generator System		200
42. Electrical Power Supply System		34
Total	27	372

## UA-69 ROVNO-4

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 4368.7 GW(e).h  
**Energy Availability Factor:** 60.3%  
**Load Factor:** 52.5%  
**Operating Factor:** 80.6%  
**Energy Unavailability Factor:** 39.7%  
**Total Off-line Time:** 1702 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	562.9	469.9	367.6	398.6	387.9	379.5	467.1	333.9	0.0	223.9	225.8	551.6	4368.7
<b>EAF (%)</b>	81.4	81.3	81.2	72.4	57.7	58.4	68.5	49.6	0.0	34.4	59.4	80.1	60.3
<b>UCF (%)</b>	81.4	81.3	81.2	81.7	81.0	80.7	79.9	60.2	0.0	34.5	59.4	80.1	66.8
<b>LF (%)</b>	79.6	73.6	52.0	58.4	54.9	55.5	66.1	47.2	0.0	31.6	33.0	78.0	52.5
<b>OF (%)</b>	100.0	103.6	98.7	100.1	100.0	100.0	98.7	74.3	0.0	43.6	47.8	100.0	80.6
<b>EUf (%)</b>	18.6	18.7	18.8	27.6	42.3	41.6	31.5	50.4	100.0	65.6	40.6	19.9	39.7
<b>PUf (%)</b>	18.6	18.7	18.8	18.1	19.0	19.3	20.1	39.8	100.0	65.5	40.6	19.9	33.2
<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	0.0	0.0
<b>XUF (%)</b>	0.0	0.0	0.0	9.3	23.3	22.3	11.4	10.5	0.0	0.1	0.0	0.0	6.5

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE ENERGY LOSSES DUE TO EXTERNAL CAUSES: THE GRID DISPATCHER'S REQUEST =72GW(E)H

### 5. Historical Summary

**Date of Construction Start:** 01 Aug 1986 **Lifetime Generation:** 20211.0 GW(e).h  
**Date of First Criticality:** 26 Sep 2004 **Cumulative Energy Availability Factor:** 62.7%  
**Date of Grid Connection:** 10 Oct 2004 **Cumulative Load Factor:** 57.5%  
**Date of Commercial Operation:** 06 Apr 2006 **Cumulative Unit Capability Factor:** 65.4%  
**Cumulative Energy Unavailability Factor:** 37.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
2006	3244.7	950.0	57.9	57.9	57.0	57.0	51.7	51.7	4326	65.5
2007	5560.9	950.0	69.6	64.6	69.5	64.1	66.8	60.3	7657	87.4
2008	4368.7	950.0	66.8	65.4	60.3	62.7	52.5	57.5	7058	80.6

### 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			2006 to 2008 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	1331			860		
D. Inspection, maintenance or repair without refuelling	203			205		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			192			
Subtotal	1534	0	192	1065	213	0
Total	1726			1278		

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

System	2008 Hours Lost	2006 to 2008 Average Hours Lost Per Year
41. Main Generator System:		213
Total	0	213

# UA-44 SOUTH UKRAINE-1

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6895.4 GW(e).h  
**Energy Availability Factor:** 84.8%  
**Load Factor:** 82.9%  
**Operating Factor:** 85.4%  
**Energy Unavailability Factor:** 15.2%  
**Total Off-line Time:** 1276 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	750.6	639.9	702.4	593.5	641.6	647.1	665.5	134.1	124.6	707.3	661.0	627.8	6895.4
<b>EAF (%)</b>	99.4	95.4	99.1	99.2	97.7	95.7	95.4	19.6	17.8	98.7	99.7	99.6	84.8
<b>UCF (%)</b>	99.4	95.4	99.1	99.2	98.2	97.5	96.4	19.8	17.8	98.7	99.7	99.6	85.1
<b>LF (%)</b>	106.2	100.2	99.4	86.9	90.8	94.6	94.2	19.0	18.2	99.9	96.6	88.8	82.9
<b>OF (%)</b>	100.0	100.3	99.9	87.1	96.5	100.0	100.0	22.7	19.0	100.0	100.0	100.0	85.4
<b>EUF (%)</b>	0.6	4.6	0.9	0.8	2.3	4.3	4.6	80.4	82.2	1.3	0.3	0.4	15.2
<b>PUF (%)</b>	0.0	4.0	0.0	0.0	0.0	0.0	0.0	79.0	82.0	0.0	0.0	0.0	13.8
<b>UCLF (%)</b>	0.6	0.6	0.9	0.8	1.8	2.5	3.6	1.2	0.2	1.3	0.3	0.4	1.2
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.5	1.8	1.0	0.3	0.0	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE ENERGY LOSSES DUE TO EXTERNAL CAUSES: HIGH TEMPERATURE OF COOLING WATER=192GW(E)H, LOAD-FOLLOWING=245GW(E)H



## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Mar 1977	<b>Lifetime Generation:</b>	136651.0 GW(e).h
<b>Date of First Criticality:</b>	09 Dec 1982	<b>Cumulative Energy Availability Factor:</b>	66.7%
<b>Date of Grid Connection:</b>	31 Dec 1982	<b>Cumulative Load Factor:</b>	67.5%
<b>Date of Commercial Operation:</b>	18 Oct 1983	<b>Cumulative Unit Capability Factor:</b>	67.5%
		<b>Cumulative Energy Unavailability Factor:</b>	33.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	1582.5	950.0	75.6	75.6	75.6	75.6	75.4	75.4	1746	79.1
1984	6075.1	950.0	71.7	72.4	71.7	72.4	72.8	73.3	6364	72.4
1985	6939.1	950.0	81.4	76.4	81.1	76.3	83.4	77.8	7148	81.6
1986	6176.1	950.0	74.1	75.7	73.5	75.4	74.2	76.7	6735	76.9
1987	6385.9	1000.0	75.6	75.7	75.6	75.5	72.9	75.8	6642	75.8
1988	5467.5	950.0	65.9	73.8	65.9	73.7	65.5	73.8	6177	70.3
1989	2501.6	950.0	30.8	67.0	30.8	66.9	30.1	66.9	3321	37.9
1990	6174.4	950.0	75.2	68.1	75.0	68.0	74.2	67.9	7063	80.6
1991	3865.9	950.0	46.5	65.5	46.5	65.4	46.4	65.3	5532	63.1
1992	4946.8	833.0	49.2	64.0	49.1	63.8	67.6	65.5	6142	69.9
1993	5277.8	950.0	62.3	63.8	61.4	63.6	63.4	65.3	5650	64.5
1994	5117.4	950.0	58.7	63.3	58.7	63.1	61.5	65.0	5667	64.7
1995	5438.6	950.0	66.1	63.6	65.4	63.3	65.4	65.0	6212	70.9
1996	5138.2	950.0	62.1	63.5	61.6	63.2	61.6	64.7	5549	63.2
1997	6196.1	950.0	73.0	64.1	72.5	63.8	74.5	65.4	6416	73.2
1998	6164.9	950.0	73.7	64.8	73.1	64.5	74.1	66.0	6477	73.9
1999	5558.9	950.0	67.1	64.9	66.5	64.6	66.8	66.1	5920	67.6
2000	5203.0	950.0	63.9	64.9	61.2	64.4	62.4	65.8	5677	64.6
2001	5563.7	950.0	68.3	65.0	66.6	64.5	66.7	65.9	6015	68.5
2002	4254.8	950.0	52.2	64.4	50.9	63.8	51.1	65.1	4625	52.8
2003	6008.2	950.0	74.2	64.9	72.6	64.2	72.2	65.5	6612	75.5
2004	6988.9	950.0	85.0	65.8	84.0	65.2	83.8	66.3	7592	86.4
2005	6068.5	950.0	78.3	66.4	77.1	65.7	72.9	66.6	6926	79.1
2006	6345.1	950.0	79.1	66.9	76.9	66.2	76.2	67.0	6988	79.8
2007	5159.8	950.0	62.7	66.8	61.6	66.0	62.0	66.8	5562	63.5
2008	6895.4	950.0	85.1	67.5	84.8	66.7	82.9	67.5	7484	85.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					398	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1158			1424		
D. Inspection, maintenance or repair without refuelling	22			346		
E. Testing of plant systems or component:				9	0	
J. Grid limitation, failure or grid unavailability					0	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			120		35	0
Z. Others					1	
Subtotal	1180	0	120	1779	436	0
Total	1300			2215		

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		11
14. Safety Systems		1
15. Reactor Cooling System:		5
16. Steam generation system:		192
31. Turbine and auxiliaries		57
32. Feedwater and Main Steam System		10
33. Circulating Water System		0
35. All other I&C Systems:		1
41. Main Generator System:		114
42. Electrical Power Supply System:		1
XX. Miscellaneous Systems:		1
Total	0	393

## UA-45 SOUTH UKRAINE-2

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6623.6 GW(e).h  
**Energy Availability Factor:** 81.1%  
**Load Factor:** 79.6%  
**Operating Factor:** 82.7%  
**Energy Unavailability Factor:** 18.9%  
**Total Off-line Time:** 1512 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	720.8	573.7	701.4	675.0	624.1	119.3	0.0	567.2	659.8	707.0	653.3	622.2	6623.6
<b>EAF (%)</b>	99.4	84.3	99.4	98.4	94.3	17.7	0.0	81.4	99.3	99.2	99.7	99.6	81.1
<b>UCF (%)</b>	99.4	84.3	99.4	98.4	94.9	18.2	0.0	83.5	99.3	99.2	99.7	99.6	81.3
<b>LF (%)</b>	102.0	89.9	99.2	98.8	88.3	17.4	0.0	80.3	96.5	99.9	95.5	88.0	79.6
<b>OF (%)</b>	100.0	89.9	99.9	100.1	97.4	20.3	0.0	85.6	100.0	100.0	100.0	100.0	82.7
<b>EUf (%)</b>	0.6	15.7	0.6	1.6	5.7	82.3	100.0	18.6	0.7	0.8	0.3	0.4	18.9
<b>PUF (%)</b>	0.0	14.9	0.0	0.0	0.0	81.3	100.0	15.5	0.0	0.0	0.0	0.0	17.6
<b>UCLF (%)</b>	0.6	0.8	0.6	1.6	5.1	0.5	0.0	1.0	0.7	0.8	0.3	0.4	1.0
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.7	0.4	0.0	2.1	0.0	0.0	0.0	0.0	0.3

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE ENERGY LOSSES DUE TO EXTERNAL CAUSES: HIGH TEMPERATURE OF COOLING WATER=178 GW(E)H, LOAD-FOLLOWING=138GW(E)H

### 5. Historical Summary

**Date of Construction Start:** 01 Oct 1979 **Lifetime Generation:** 121773.0 GW(e).h  
**Date of First Criticality:** 30 Dec 1984 **Cumulative Energy Availability Factor:** 63.2%  
**Date of Grid Connection:** 06 Jan 1985 **Cumulative Load Factor:** 63.1%  
**Date of Commercial Operation:** 06 Apr 1985 **Cumulative Unit Capability Factor:** 64.3%  
**Cumulative Energy Unavailability Factor:** 36.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	4666.7	950.0	73.3	73.3	73.3	73.3	74.4	74.4	4924	74.6
1986	5565.5	950.0	67.0	69.7	66.2	69.3	66.9	70.1	6315	72.1
1987	1641.7	1000.0	22.0	51.8	22.0	51.6	18.7	50.8	1941	22.2
1988	4850.6	950.0	57.4	53.3	57.4	53.1	58.1	52.8	5198	59.2
1989	4437.3	950.0	54.3	53.5	54.3	53.3	53.3	52.9	6674	76.2
1990	1769.0	950.0	21.9	48.1	21.9	47.9	21.3	47.4	4522	51.6
1991	6209.8	950.0	72.0	51.6	72.0	51.5	74.6	51.4	6722	76.7
1992	6412.1	1000.0	72.9	54.4	71.7	54.2	73.0	54.3	6574	74.8
1993	5204.0	950.0	64.0	55.5	61.7	55.0	62.5	55.2	6570	75.0
1994	3958.5	950.0	47.3	54.7	46.9	54.2	47.6	54.5	6471	73.9
1995	5429.4	950.0	66.1	55.7	65.2	55.2	65.2	55.5	6514	74.4
1996	4593.7	950.0	55.4	55.7	55.0	55.2	55.0	55.4	5590	63.6
1997	6326.5	950.0	77.2	57.4	75.4	56.8	76.0	57.0	7400	84.5
1998	4542.4	950.0	55.1	57.2	54.0	56.6	54.6	56.9	4867	55.6
1999	5537.9	950.0	72.0	58.2	66.4	57.2	66.5	57.5	6372	72.7
2000	4103.5	950.0	50.0	57.7	49.2	56.7	49.2	57.0	4486	51.1
2001	6206.5	950.0	74.8	58.7	74.4	57.8	74.4	58.0	6869	78.2
2002	6057.2	950.0	74.2	59.6	72.7	58.6	72.8	58.8	6565	74.9
2003	5507.7	950.0	66.2	59.9	65.8	59.0	66.2	59.2	5868	67.0
2004	6899.7	950.0	86.1	61.2	82.2	60.2	82.7	60.4	7647	87.1
2005	6479.2	950.0	82.0	62.2	81.1	61.2	77.9	61.2	7243	82.7
2006	6110.2	950.0	77.5	62.9	75.3	61.8	73.4	61.8	6847	78.2
2007	6241.7	950.0	78.0	63.6	75.8	62.4	75.0	62.4	6892	78.7

2008	6623.6	950.0	81.3	64.3	81.1	63.2	79.6	63.1	7248	82.7
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## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		19			512	
B. Refuelling without a maintenance outage					0	
C. Inspection, maintenance or repair combined with refuelling	1425			1344		
D. Inspection, maintenance or repair without refuelling	92			468	4	
E. Testing of plant systems or component				11		
H. Nuclear regulatory requirement					1	4
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					64	
L. Human factor related					1	
Subtotal	1517	19	0	1823	582	4
Total		1536			2409	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		9
14. Safety Systems		0
15. Reactor Cooling System		25
16. Steam generation system		396
17. Safety I&C Systems (excluding reactor I&C)		11
31. Turbine and auxiliaries	19	23
32. Feedwater and Main Steam System		36
41. Main Generator System		9
42. Electrical Power Supply System		0
Total	19	509

## UA-48 SOUTH UKRAINE-3

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAA (PRODUCTION AMALGAMATION 'ATOMMASH', VOLGODONSK)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 4560.8 GW(e).h  
**Energy Availability Factor:** 58.5%  
**Load Factor:** 54.8%  
**Operating Factor:** 68.0%  
**Energy Unavailability Factor:** 41.5%  
**Total Off-line Time:** 2799 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	694.6	653.8	426.8	441.8	507.2	486.1	506.8	551.9	89.0	0.0	47.6	155.1	4560.8
<b>EAF (%)</b>	99.6	99.6	61.3	66.4	73.6	73.1	73.7	80.1	13.5	0.0	32.9	30.3	58.5
<b>UCF (%)</b>	99.7	99.8	61.4	67.6	75.6	76.1	76.3	83.6	13.8	0.0	32.9	30.3	59.5
<b>LF (%)</b>	98.3	102.4	60.4	64.7	71.8	71.1	71.7	78.1	13.0	0.0	7.0	21.9	54.8
<b>OF (%)</b>	100.0	103.6	62.9	91.2	100.0	100.0	100.0	100.0	16.9	0.0	12.2	31.6	68.0
<b>EUF (%)</b>	0.4	0.4	38.7	33.6	26.4	26.9	26.3	19.9	86.5	100.0	67.1	69.7	41.5
<b>PUF (%)</b>	0.0	0.0	0.0	21.9	23.3	21.8	21.8	13.0	85.6	100.0	66.9	69.5	35.5
<b>UCLF (%)</b>	0.3	0.2	38.6	10.5	1.2	2.1	1.9	3.4	0.5	0.0	0.2	0.3	5.0
<b>XUF (%)</b>	0.1	0.2	0.1	1.1	2.0	3.0	2.6	3.5	0.4	0.0	0.0	0.0	1.1

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE ENERGY LOSSES DUE TO EXTERNAL CAUSES: HIGH TEMPERATURE OF COOLING WATER=139GW(E)H, LOAD-FOLLOWING=242GW(E)H

### 5. Historical Summary

**Date of Construction Start:** 01 Feb 1985 **Lifetime Generation:** 105528.0 GW(e).h  
**Date of First Criticality:** 01 Sep 1989 **Cumulative Energy Availability Factor:** 70.4%  
**Date of Grid Connection:** 20 Sep 1989 **Cumulative Load Factor:** 69.6%  
**Date of Commercial Operation:** 29 Dec 1989 **Cumulative Unit Capability Factor:** 71.6%  
**Cumulative Energy Unavailability Factor:** 29.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	501.9	950.0	100.0	100.0	100.0	100.0	71.0	71.0	563	75.7
1990	5691.6	950.0	69.4	71.8	69.4	71.8	68.4	68.6	6408	73.2
1991	5762.8	950.0	70.4	71.1	70.0	70.9	69.2	68.9	6996	79.9
1992	6458.1	1000.0	75.2	72.5	75.2	72.4	73.5	70.5	6646	75.7
1993	6043.4	950.0	72.8	72.6	71.7	72.2	72.6	71.0	6527	74.5
1994	5565.0	950.0	66.5	71.4	66.4	71.1	66.9	70.2	6223	71.0
1995	4954.8	950.0	60.2	69.6	59.5	69.2	59.5	68.4	6300	71.9
1996	6155.0	950.0	76.4	70.5	73.8	69.8	73.8	69.2	7463	85.0
1997	6514.8	950.0	79.7	71.7	77.7	70.8	78.3	70.3	7079	80.8
1998	5851.0	950.0	71.0	71.6	69.9	70.7	70.3	70.3	6396	73.0
1999	5464.3	950.0	67.2	71.1	65.5	70.2	65.7	69.9	6244	71.3
2000	5909.7	950.0	73.3	71.3	70.6	70.2	70.8	69.9	6588	75.0
2001	6136.3	950.0	76.3	71.8	73.7	70.5	73.5	70.2	6985	79.5
2002	6335.2	950.0	77.5	72.2	76.0	70.9	76.1	70.7	7043	80.4
2003	6036.5	950.0	74.3	72.3	73.1	71.1	72.5	70.8	6680	76.3
2004	6625.1	950.0	82.0	73.0	79.9	71.7	79.4	71.4	7246	82.5
2005	6801.0	950.0	85.7	73.8	85.0	72.5	81.7	72.0	7548	86.2
2006	4290.9	950.0	53.6	72.6	53.0	71.4	51.6	70.8	4734	54.0
2007	5326.1	950.0	67.3	72.3	66.1	71.1	64.0	70.5	5978	68.2
2008	4560.8	950.0	59.5	71.6	58.5	70.4	54.8	69.6	5961	68.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1990 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		339			300	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	1775			1472		
D. Inspection, maintenance or repair without refuelling	523			231		
E. Testing of plant systems or component:				21		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			185			5
Subtotal	2298	339	185	1724	300	5
Total	2822			2029		

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

System	2008 Hours Lost	1990 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		4
12. Reactor I&C Systems		4
13. Reactor Auxiliary Systems		0
15. Reactor Cooling Systems		2
16. Steam generation system:		7
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		25
32. Feedwater and Main Steam System		0
33. Circulating Water System		0
35. All other I&C Systems		1
41. Main Generator Systems	339	246
42. Electrical Power Supply Systems		1
Total	339	293

# UA-54 ZAPOROZHE-1

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6227.7 GW(e).h  
**Energy Availability Factor:** 80.3%  
**Load Factor:** 74.6%  
**Operating Factor:** 76.8%  
**Energy Unavailability Factor:** 19.7%  
**Total Off-line Time:** 2037 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	685.7	674.2	710.1	244.8	0.0	319.3	671.7	672.6	665.2	697.3	645.8	241.0	6227.7
<b>EAF (%)</b>	99.3	99.2	98.6	32.7	0.0	47.7	95.8	95.7	97.2	98.3	98.9	99.9	80.3
<b>UCF (%)</b>	99.3	99.2	98.6	32.7	0.0	49.3	99.5	99.6	99.1	99.5	99.5	99.9	81.4
<b>LF (%)</b>	97.0	102.0	100.5	35.8	0.0	46.7	95.0	95.2	97.3	98.5	94.4	34.1	74.6
<b>OF (%)</b>	100.0	100.0	99.9	36.7	0.0	50.6	100.0	100.0	100.0	100.0	100.0	35.5	76.8
<b>EUF (%)</b>	0.7	0.8	1.4	67.3	100.0	52.3	4.2	4.3	2.8	1.7	1.1	0.1	19.7
<b>PUF (%)</b>	0.0	0.0	0.0	67.1	100.0	50.4	0.0	0.0	0.0	0.0	0.0	0.0	18.1
<b>UCLF (%)</b>	0.7	0.8	1.4	0.2	0.0	0.3	0.5	0.4	0.9	0.5	0.5	0.2	0.5
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	1.6	3.8	3.8	1.9	1.3	0.6	0.0	1.1

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO CONDENSER PRESSURE DEVIATION FROM THE NOMINAL ONE - 14 GW(E)H; STEAM UNDERHEATING IN MOISTURE SEPARATOR - 21 GW(E)H AND EXTERNAL CAUSES: HIGH TEMPERATURE OF COOLING WATER=148GW(E)H, TRANSMISSION LINE LIMITATION=41 GW(E)H, LOAD-FOLLOWING=491GW(E)H.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Apr 1980	<b>Lifetime Generation:</b>	119640.0 GW(e).h
<b>Date of First Criticality:</b>	07 Dec 1984	<b>Cumulative Energy Availability Factor:</b>	63.5%
<b>Date of Grid Connection:</b>	10 Dec 1984	<b>Cumulative Load Factor:</b>	62.8%
<b>Date of Commercial Operation:</b>	25 Dec 1985	<b>Cumulative Unit Capability Factor:</b>	65.7%
		<b>Cumulative Energy Unavailability Factor:</b>	36.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	495.0	950.0	70.8	70.8	70.8	70.8	70.0	70.0	594	79.8
1986	4826.3	950.0	61.5	62.3	58.3	59.2	58.0	58.9	5580	63.7
1987	6720.9	1000.0	80.8	71.4	80.8	69.9	76.7	67.7	7205	82.2
1988	5170.4	950.0	67.4	70.1	67.2	69.0	62.0	65.9	6225	70.9
1989	0.0	950.0	0.0	53.2	0.0	52.3	0.0	50.0	0	0.0
1990	4668.7	950.0	58.8	54.3	56.4	53.1	56.1	51.2	5684	64.9
1991	5332.2	950.0	68.5	56.6	64.2	54.9	64.1	53.3	6343	72.4
1992	6103.5	950.0	70.3	58.5	67.8	56.8	73.1	56.0	6739	76.7
1993	4209.7	950.0	53.5	57.9	52.1	56.2	50.6	55.4	6591	75.2
1994	3771.0	950.0	45.5	56.5	45.5	55.0	45.3	54.3	5062	57.8
1995	3557.3	950.0	44.9	55.4	42.7	53.8	42.7	53.1	4213	48.1
1996	4299.5	950.0	53.5	55.2	51.5	53.6	51.5	53.0	5224	59.5
1997	4070.6	950.0	53.9	55.1	48.9	53.2	48.9	52.7	5531	63.1
1998	5517.5	950.0	68.7	56.1	66.3	54.2	66.3	53.7	6122	69.9
1999	5992.5	950.0	84.0	58.1	72.0	55.5	72.0	55.0	7422	84.7
2000	4222.7	950.0	52.0	57.7	50.3	55.1	50.6	54.7	4589	52.2
2001	5847.1	950.0	71.8	58.6	69.9	56.0	70.1	55.7	6434	73.2
2002	6735.0	950.0	83.2	60.0	80.6	57.5	80.9	57.1	7334	83.7
2003	6596.4	950.0	81.9	61.2	79.0	58.7	79.3	58.3	7223	82.5
2004	6748.3	950.0	82.6	62.3	80.6	59.8	80.9	59.5	7290	83.0
2005	6018.8	950.0	77.8	63.1	76.8	60.6	72.3	60.2	6823	77.9
2006	6899.0	950.0	83.7	64.1	83.3	61.7	82.9	61.2	7380	84.2
2007	6921.0	950.0	83.6	65.0	83.5	62.7	83.2	62.2	7406	84.5
2008	6227.7	950.0	81.4	65.7	80.3	63.5	74.6	62.8	6748	76.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				329	313	3
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling	1556			1502	32	
D. Inspection, maintenance or repair without refuelling				352	10	
E. Testing of plant systems or component:				6		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			479		3	4
Subtotal	1556	0	479	2189	369	7
Total	2035			2565		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		46
15. Reactor Cooling System:		32
16. Steam generation system:		410
17. Safety I&C Systems (excluding reactor I&C)		8
31. Turbine and auxiliaries:		51
32. Feedwater and Main Steam System		37
33. Circulating Water System		3
35. All other I&C Systems:		0
41. Main Generator System:		36
42. Electrical Power Supply System:		14
XX. Miscellaneous Systems:		0



Total	0	637
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# UA-56 ZAPOROZHE-2

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6763.5 GW(e).h  
**Energy Availability Factor:** 84.3%  
**Load Factor:** 81.0%  
**Operating Factor:** 85.0%  
**Energy Unavailability Factor:** 15.7%  
**Total Off-line Time:** 1315 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	703.0	671.2	712.5	631.2	703.5	0.0	176.2	693.9	666.3	705.3	468.9	631.4	6763.5
<b>EAF (%)</b>	98.2	99.4	99.5	92.6	98.7	0.0	26.4	98.1	99.1	99.9	98.8	99.7	84.3
<b>UCF (%)</b>	98.2	99.4	99.5	92.6	98.7	0.0	27.2	100.0	99.9	99.9	99.4	99.7	84.6
<b>LF (%)</b>	99.5	101.5	100.8	92.3	99.5	0.0	24.9	98.2	97.4	99.7	68.5	89.3	81.0
<b>OF (%)</b>	98.7	100.0	99.9	93.3	100.0	0.0	28.0	100.0	100.0	100.0	100.0	100.0	85.0
<b>EUf (%)</b>	1.8	0.6	0.5	7.4	1.3	100.0	73.6	1.9	0.9	0.1	1.2	0.3	15.7
<b>PUf (%)</b>	1.3	0.0	0.0	6.9	0.9	100.0	72.8	0.0	0.0	0.0	0.0	0.0	15.1
<b>UCLF (%)</b>	0.5	0.6	0.5	0.4	0.4	0.0	0.1	0.1	0.1	0.1	0.6	0.3	0.3
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.8	0.7	0.0	0.6	0.0	0.3

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO CONDENSER PRESSURE DEVIATION FROM THE NOMINAL ONE - 15 GW(E)H; STEAM UNDERHEATING IN MOISTURE SEPARATOR - 10 GW(E)H AND EXTERNAL CAUSES: HIGH TEMPERATURE OF COOLING WATER=139GW(E)H, TRANSMISSION LINE LIMITATION=32 GW(E)H, LOAD-FOLLOWING=273GW(E)H.

## 5. Historical Summary

**Date of Construction Start:** 01 Jan 1981 **Lifetime Generation:** 123472.0 GW(e).h  
**Date of First Criticality:** 28 Jun 1985 **Cumulative Energy Availability Factor:** 68.0%  
**Date of Grid Connection:** 22 Jul 1985 **Cumulative Load Factor:** 66.4%  
**Date of Commercial Operation:** 15 Feb 1986 **Cumulative Unit Capability Factor:** 69.6%  
**Cumulative Energy Unavailability Factor:** 32.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	5112.9	950.0	70.9	70.9	68.4	68.4	67.1	67.1	5764	71.9
1987	6058.3	1000.0	76.0	73.6	76.0	72.5	69.2	68.2	6675	76.2
1988	6088.6	950.0	81.2	76.2	81.2	75.4	73.0	69.8	7253	82.6
1989	3050.9	950.0	45.1	68.4	45.1	67.8	36.7	61.5	3393	38.7
1990	1869.1	950.0	22.6	59.1	22.3	58.6	22.5	53.6	2165	24.7
1991	4583.9	950.0	56.1	58.6	55.4	58.1	55.1	53.9	5112	58.4
1992	6551.7	950.0	77.7	61.4	76.2	60.7	78.5	57.4	7016	79.9
1993	4386.1	950.0	56.6	60.8	53.8	59.8	52.7	56.8	6194	70.7
1994	4103.5	950.0	49.9	59.6	49.8	58.7	49.3	56.0	5924	67.6
1995	5051.8	950.0	63.5	60.0	60.7	58.9	60.7	56.5	7329	83.7
1996	5373.0	950.0	67.5	60.6	64.4	59.4	64.4	57.2	6247	71.1
1997	6081.7	950.0	76.5	62.0	73.0	60.6	73.1	58.5	6745	77.0
1998	4922.8	950.0	62.9	62.0	59.0	60.4	59.2	58.6	5601	63.9
1999	5476.0	950.0	66.9	62.4	65.7	60.8	65.8	59.1	5887	67.2
2000	5626.4	950.0	70.7	63.0	67.4	61.3	67.4	59.6	6281	71.5
2001	5867.6	950.0	72.5	63.6	70.6	61.8	70.3	60.3	6422	73.1
2002	6315.6	950.0	78.8	64.5	75.9	62.7	75.9	61.2	6834	78.0
2003	6742.4	950.0	83.8	65.5	80.9	63.7	81.0	62.3	7387	84.3
2004	6944.3	950.0	86.0	66.6	83.1	64.7	83.2	63.4	7531	85.7
2005	6303.2	950.0	83.4	67.4	82.4	65.6	75.7	64.0	7332	83.7
2006	6644.7	950.0	83.0	68.2	82.8	66.4	79.8	64.8	7297	83.3
2007	7064.5	950.0	85.3	69.0	85.1	67.3	84.9	65.7	7528	85.9
2008	6763.5	950.0	84.6	69.6	84.3	68.0	81.0	66.4	7470	85.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		0			397	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	1256			1425		
D. Inspection, maintenance or repair without refuelling	59			497		
E. Testing of plant systems or component:				5		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					2	14
L. Human factor related					0	
Subtotal	1315	0	0	1927	402	14
Total	1315			2343		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems:		11
13. Reactor Auxiliary System:		0
15. Reactor Cooling System:		9
16. Steam generation system:		241
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries:		37
32. Feedwater and Main Steam System		8
35. All other I&C Systems:	0	8
41. Main Generator System:		65
42. Electrical Power Supply System:		4
Total	0	383

## UA-78 ZAPOROZHE-3

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power at the beginning of 2008:** 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 2008

**Net Energy Production:** 6843.2 GW(e).h  
**Energy Availability Factor:** 83.7%  
**Load Factor:** 82.0%  
**Operating Factor:** 86.4%  
**Energy Unavailability Factor:** 16.3%  
**Total Off-line Time:** 1195 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	692.6	650.5	693.2	663.4	668.6	640.6	617.3	646.0	634.9	0.0	233.7	702.3	6843.2
EAF (%)	99.4	98.9	98.9	97.9	97.0	95.1	94.3	94.1	94.0	-0.1	36.0	99.1	83.7
UCF (%)	99.4	98.9	99.1	99.1	99.0	98.5	98.4	98.2	98.2	-0.1	36.2	99.4	85.3
LF (%)	98.0	98.4	98.1	97.0	94.6	93.7	87.3	91.4	92.8	0.0	34.2	99.4	82.0
OF (%)	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	0.0	37.5	100.0	86.4
EU (%)	0.6	1.1	1.1	2.1	3.0	4.9	5.7	5.9	6.0	100.1	64.0	0.9	16.3
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	100.1	63.6	0.0	13.7
UCLF (%)	0.6	1.1	0.9	0.9	1.1	1.5	1.7	1.8	1.4	0.0	0.3	0.6	1.0
XUF (%)	0.0	0.0	0.3	1.2	2.0	3.4	4.0	4.2	4.2	0.0	0.2	0.3	1.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO CONDENSER PRESSURE DEVIATION FROM THE NOMINAL ONE - 64 GW(E)H AND EXTERNAL CAUSES: HIGH TEMPERATURE OF COOLING WATER=174GW(E)H, TRANSMISSION LINE LIMITATION=55 GW(E)H, LOAD-FOLLOWING=15GW(E)H.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1982  
**Date of First Criticality:** 04 Dec 1986  
**Date of Grid Connection:** 10 Dec 1986  
**Date of Commercial Operation:** 05 Mar 1987

**Lifetime Generation:** 119719.0 GW(e).h  
**Cumulative Energy Availability Factor:** 69.9%  
**Cumulative Load Factor:** 68.5%  
**Cumulative Unit Capability Factor:** 72.7%  
**Cumulative Energy Unavailability Factor:** 30.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	5757.0	1000.0	80.3	80.3	80.3	80.3	78.4	78.4	5886	80.1
1988	6414.3	950.0	81.3	80.9	81.3	80.9	76.9	77.6	7077	80.6
1989	6614.4	950.0	80.9	80.9	80.9	80.9	79.5	78.2	7373	84.2
1990	5625.3	950.0	68.1	77.6	67.7	77.5	67.6	75.5	6166	70.4
1991	4958.8	950.0	61.1	74.2	59.9	73.9	59.6	72.2	5877	67.1
1992	4140.9	950.0	54.0	70.8	50.5	69.9	49.6	68.4	5274	60.0
1993	5416.6	950.0	67.6	70.3	66.0	69.3	65.1	67.9	7263	82.9
1994	4273.7	950.0	52.5	68.0	52.5	67.2	51.4	65.8	6068	69.3
1995	4027.8	950.0	49.7	66.0	48.4	65.1	48.4	63.9	5804	66.3
1996	4940.2	950.0	62.3	65.6	59.2	64.5	59.2	63.4	6096	69.4
1997	4869.8	950.0	70.1	66.0	58.5	63.9	58.5	62.9	6544	74.7
1998	4953.2	950.0	63.1	65.8	59.5	63.6	59.5	62.6	6316	72.1
1999	5114.5	950.0	64.7	65.7	61.5	63.4	61.5	62.6	6162	70.3
2000	6123.2	950.0	76.6	66.5	73.0	64.1	73.4	63.3	6875	78.3
2001	6307.8	950.0	80.9	67.5	75.7	64.9	75.6	64.2	7027	80.0
2002	6602.0	950.0	84.4	68.5	79.2	65.8	79.3	65.1	7470	85.3
2003	6588.9	950.0	81.9	69.3	79.0	66.6	79.2	65.9	7236	82.6
2004	6308.7	950.0	85.4	70.2	75.5	67.1	75.6	66.5	7371	83.9
2005	6224.1	950.0	84.4	71.0	83.5	67.9	74.8	66.9	7229	82.5
2006	6048.0	950.0	84.8	71.7	83.3	68.7	72.7	67.2	7031	80.3
2007	6631.4	950.0	81.7	72.1	80.5	69.3	79.7	67.8	7268	83.0
2008	6843.2	950.0	85.3	72.7	83.7	69.9	82.0	68.5	7589	86.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					91	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	1195			1452		
D. Inspection, maintenance or repair without refuelling				221		
E. Testing of plant systems or component:				20	3	
J. Grid limitation, failure or grid unavailability						11
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				1	4	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.						11
Subtotal	1195	0	0	1694	106	57
Total	1195			1857		

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		3
14. Safety Systems		5
15. Reactor Cooling Systems		0
16. Steam generation systems		14
31. Turbine and auxiliaries		5
32. Feedwater and Main Steam System		13
33. Circulating Water System		1
35. All other I&C Systems		1
41. Main Generator Systems		29
42. Electrical Power Supply Systems		4
XX. Miscellaneous Systems		0
Total	0	77

## UA-79 ZAPOROZHE-4

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6031.6 GW(e).h  
**Energy Availability Factor:** 79.6%  
**Load Factor:** 72.3%  
**Operating Factor:** 82.7%  
**Energy Unavailability Factor:** 20.4%  
**Total Off-line Time:** 1520 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	511.2	0.0	0.0	633.2	703.8	672.8	649.7	642.6	549.8	679.3	460.6	528.5	6031.6
<b>EAF (%)</b>	73.2	0.0	0.1	93.2	99.5	98.3	97.5	95.7	97.4	99.5	98.8	99.6	79.6
<b>UCF (%)</b>	93.5	0.0	0.1	93.2	99.7	99.9	99.7	98.4	99.6	99.8	99.5	99.6	82.2
<b>LF (%)</b>	72.3	0.0	0.0	92.6	99.6	98.4	91.9	90.9	80.4	96.0	67.3	74.8	72.3
<b>OF (%)</b>	93.8	0.0	0.0	95.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.7
<b>EUF (%)</b>	26.8	100.0	99.9	6.8	0.5	1.7	2.5	4.3	2.6	0.5	1.2	0.4	20.4
<b>PUF (%)</b>	6.4	100.0	99.9	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.3
<b>UCLF (%)</b>	0.1	0.0	0.0	1.7	0.3	0.1	0.3	1.6	0.4	0.2	0.5	0.4	0.5
<b>XUF (%)</b>	20.4	0.0	0.0	0.0	0.2	1.6	2.2	2.7	2.2	0.3	0.7	0.0	2.6

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE AN ENERGY LOSSES DUE TO CONDENSER PRESSURE DEVIATION FROM THE NOMINAL ONE - 21 GW(E)H AND EXTERNAL CAUSES: HIGH TEMPERATURE OF COOLING WATER=175GW(E)H, TRANSMISSION LINE LIMITATION=202 GW(E)H, LOAD-FOLLOWING=377GW(E)H.

### 5. Historical Summary

**Date of Construction Start:** 01 Apr 1983 **Lifetime Generation:** 120469.0 GW(e).h  
**Date of First Criticality:** 15 Dec 1987 **Cumulative Energy Availability Factor:** 73.5%  
**Date of Grid Connection:** 18 Dec 1987 **Cumulative Load Factor:** 72.4%  
**Date of Commercial Operation:** 14 Apr 1988 **Cumulative Unit Capability Factor:** 76.1%  
**Cumulative Energy Unavailability Factor:** 26.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	4798.9	950.0	79.1	79.1	79.1	79.1	76.5	76.5	5278	80.0
1989	5828.1	950.0	73.1	75.7	73.1	75.7	70.0	72.8	6613	75.5
1990	6637.3	950.0	79.8	77.2	78.9	76.8	79.8	75.3	7393	84.4
1991	4259.5	950.0	51.3	70.3	51.1	70.0	51.2	68.9	5114	58.4
1992	6962.3	1000.0	78.8	72.1	78.6	71.8	79.3	71.2	6961	79.2
1993	6118.8	950.0	74.1	72.5	73.4	72.1	73.5	71.6	6821	77.9
1994	5888.7	950.0	71.4	72.3	71.3	72.0	70.8	71.5	6718	76.7
1995	4717.1	950.0	58.4	70.5	56.7	70.0	56.7	69.6	5902	67.4
1996	5372.2	950.0	66.3	70.0	64.4	69.4	64.4	69.0	6372	72.5
1997	6284.4	950.0	79.9	71.1	75.5	70.0	75.5	69.6	7060	80.6
1998	6022.0	950.0	74.0	71.3	72.4	70.2	72.4	69.9	6839	78.1
1999	3921.3	950.0	49.8	69.5	47.1	68.3	47.1	68.0	4630	52.9
2000	6708.4	950.0	83.8	70.6	80.3	69.2	80.4	68.9	7423	84.5
2001	6091.2	950.0	89.8	72.0	73.1	69.5	73.0	69.2	7884	89.8
2002	6337.1	950.0	78.5	72.5	76.1	69.9	76.1	69.7	6895	78.7
2003	6736.3	950.0	82.4	73.1	80.9	70.6	80.9	70.4	7248	82.7
2004	6537.6	950.0	88.5	74.0	78.3	71.1	78.3	70.9	7247	82.5
2005	6511.9	950.0	85.1	74.6	84.1	71.8	78.2	71.3	7498	85.6
2006	6621.8	950.0	85.2	75.2	84.8	72.5	79.6	71.7	7186	82.0
2007	7027.8	950.0	87.1	75.8	86.2	73.2	84.4	72.4	7645	87.3
2008	6031.6	950.0	82.2	76.1	79.6	73.5	72.3	72.4	7265	82.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					146	
B. Refuelling without a maintenance					30	
C. Inspection, maintenance or repair combined with refuelling	1515			1464		
D. Inspection, maintenance or repair without refuelling				133		
E. Testing of plant systems or component:				17	0	
J. Grid limitation, failure or grid unavailability			4			0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						39
Subtotal	1515	0	4	1614	176	39
Total		1519			1829	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		5
14. Safety Systems		1
15. Reactor Cooling Systems		10
16. Steam generation systems		17
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System		5
35. All other I&C Systems		0
41. Main Generator Systems		70
42. Electrical Power Supply Systems		5
XX. Miscellaneous Systems		1
Total	0	140

# UA-126 ZAPOROZHE-5

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6935.9 GW(e).h  
**Energy Availability Factor:** 86.9%  
**Load Factor:** 83.3%  
**Operating Factor:** 88.0%  
**Energy Unavailability Factor:** 13.1%  
**Total Off-line Time:** 1052 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	635.2	677.7	715.3	680.7	680.9	668.2	680.9	76.4	235.9	697.7	522.3	664.7	6935.9
<b>EAF (%)</b>	100.0	100.0	99.7	99.7	99.8	98.4	97.2	12.7	36.8	100.0	99.5	100.0	86.9
<b>UCF (%)</b>	100.0	100.0	99.7	99.7	100.0	100.0	100.0	14.7	37.5	100.0	100.0	100.0	87.6
<b>LF (%)</b>	89.9	106.2	101.2	99.6	96.3	97.7	96.3	10.8	34.5	98.6	76.4	94.1	83.3
<b>OF (%)</b>	100.0	103.6	99.9	100.1	100.0	100.0	100.0	15.1	38.3	100.0	100.0	100.0	88.0
<b>EUf (%)</b>	0.0	0.0	0.3	0.3	0.2	1.6	2.8	87.3	63.2	0.0	0.5	0.0	13.1
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.3	62.5	0.0	0.0	0.0	12.4
<b>UCLF (%)</b>	0.0	0.0	0.4	0.3	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	0.2	1.6	2.8	1.9	0.6	0.0	0.5	0.0	0.6

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE ENERGY LOSSES DUE TO EXTERNAL CAUSES: HIGH TEMPERATURE OF COOLING WATER=120GW(E)H, TRANSMISSION LINE LIMITATION=90 GW(E)H, LOAD-FOLLOWING=217GW(E)H

## 5. Historical Summary

**Date of Construction Start:** 01 Nov 1985 **Lifetime Generation:** 111991.0 GW(e).h  
**Date of First Criticality:** 20 Jul 1989 **Cumulative Energy Availability Factor:** 73.9%  
**Date of Grid Connection:** 14 Aug 1989 **Cumulative Load Factor:** 73.3%  
**Date of Commercial Operation:** 27 Oct 1989 **Cumulative Unit Capability Factor:** 75.6%  
**Cumulative Energy Unavailability Factor:** 26.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	1670.0	950.0	83.1	83.1	83.1	83.1	79.6	79.6	1957	88.6
1990	4678.7	950.0	57.9	63.0	56.6	62.0	56.2	60.9	6002	68.5
1991	6554.9	950.0	79.5	70.3	78.4	69.3	78.8	68.8	7319	83.6
1992	6898.8	1000.0	80.1	73.4	79.2	72.4	78.5	71.9	7032	80.1
1993	5661.8	950.0	68.9	72.4	68.3	71.5	68.0	71.0	6735	76.9
1994	4858.9	950.0	59.1	69.9	59.1	69.1	58.4	68.7	6779	77.4
1995	5391.9	950.0	66.0	69.3	64.7	68.4	64.8	68.0	6506	74.3
1996	6126.0	950.0	74.1	69.9	73.4	69.1	73.4	68.8	6799	77.4
1997	6381.5	950.0	76.2	70.7	75.8	69.9	76.7	69.7	6705	76.5
1998	5856.2	950.0	70.7	70.7	70.1	69.9	70.4	69.8	6249	71.3
1999	5070.2	950.0	63.0	70.0	60.6	69.0	60.9	68.9	5525	63.1
2000	6286.6	950.0	77.9	70.7	74.9	69.6	75.3	69.5	6928	78.9
2001	5890.8	950.0	76.2	71.1	70.7	69.6	70.6	69.6	6751	76.9
2002	6222.5	950.0	80.8	71.8	74.5	70.0	74.8	70.0	6983	79.7
2003	6585.5	950.0	80.2	72.4	79.0	70.6	79.1	70.6	7107	81.1
2004	6826.7	950.0	85.6	73.3	81.6	71.4	81.8	71.4	7551	86.0
2005	6278.9	950.0	81.5	73.8	80.8	71.9	75.4	71.6	6975	79.6
2006	6713.6	950.0	83.7	74.4	83.3	72.6	80.7	72.1	7297	83.3
2007	6936.5	950.0	84.3	74.9	84.3	73.2	83.4	72.7	7408	84.6
2008	6935.9	950.0	87.6	75.6	86.9	73.9	83.3	73.3	7708	88.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					91	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	1076			1347		
D. Inspection, maintenance or repair without refuelling				234		
E. Testing of plant systems or component:				24		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	21
Subtotal	1076	0	0	1605	100	21
Total	1076			1726		

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems:		7
14. Safety Systems:		1
15. Reactor Cooling System:		8
16. Steam generation system:		42
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries:		8
32. Feedwater and Main Steam System		7
41. Main Generator System:		7
42. Electrical Power Supply System:		6
Total	0	88

# UA-127 ZAPOROZHE-6

**Operator:** NNEGC (NATIONAL NUCLEAR ENERGY GENERATING COMPANY <ENERGOATOM>)

**Contractor:** PAIP (PRODUCTION AMALGAMATION IZHORSKY PLANT ATOMMASH,VOLGODONSK,RUSSIA)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6355.3 GW(e).h  
**Energy Availability Factor:** 83.7%  
**Load Factor:** 76.4%  
**Operating Factor:** 78.6%  
**Energy Unavailability Factor:** 16.3%  
**Total Off-line Time:** 1872 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	501.7	691.2	734.3	60.5	0.0	680.3	697.9	701.9	686.2	708.6	415.7	477.0	6355.3
<b>EAF (%)</b>	100.0	100.0	100.0	7.1	0.0	99.0	99.1	99.2	100.0	100.0	100.0	100.0	83.7
<b>UCF (%)</b>	100.0	100.0	100.0	7.1	0.0	99.1	100.0	100.0	100.0	100.0	100.0	100.0	83.8
<b>LF (%)</b>	71.0	108.3	103.9	8.9	0.0	99.5	98.7	99.3	100.3	100.1	60.8	67.5	76.4
<b>OF (%)</b>	100.0	103.6	99.9	10.7	0.1	100.0	100.0	100.0	100.0	100.0	64.3	66.0	78.6
<b>EUF (%)</b>	0.0	0.0	0.0	92.9	100.0	1.0	0.9	0.8	0.0	0.0	0.0	0.0	16.3
<b>PUF (%)</b>	0.0	0.0	0.0	92.9	100.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	16.2
<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	0.1	0.9	0.8	0.0	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

THERE WAS THE NPP OPERATION AT FULL POWER IN BASE LOAD MODE. BUT THERE WERE ENERGY LOSSES DUE TO EXTERNAL CAUSES: HIGH TEMPERATURE OF COOLING WATER=116GW(E)H, TRANSMISSION LINE LIMITATION=225 GW(E)H, LOAD-FOLLOWING=514GW(E)H

## 5. Historical Summary

**Date of Construction Start:** 01 Jun 1986 **Lifetime Generation:** 80045.0 GW(e).h  
**Date of First Criticality:** 06 Oct 1995 **Cumulative Energy Availability Factor:** 79.1%  
**Date of Grid Connection:** 19 Oct 1995 **Cumulative Load Factor:** 77.5%  
**Date of Commercial Operation:** 16 Sep 1996 **Cumulative Unit Capability Factor:** 81.2%  
**Cumulative Energy Unavailability Factor:** 20.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1996	2359.7	950.0	86.4	86.4	84.8	84.8	84.8	84.8	2540	86.7
1997	6332.7	950.0	75.5	78.2	75.2	77.6	76.1	78.3	6640	75.8
1998	6132.2	950.0	76.2	77.4	73.4	75.8	73.7	76.3	6766	77.2
1999	6165.4	950.0	78.4	77.7	74.1	75.3	74.1	75.6	6934	79.2
2000	5844.2	950.0	70.1	75.9	69.3	73.9	70.0	74.3	6191	70.5
2001	6336.2	950.0	80.1	76.7	75.2	74.2	75.9	74.6	7118	81.0
2002	6790.6	950.0	83.4	77.8	81.0	75.2	81.6	75.7	7393	84.4
2003	7006.4	950.0	86.3	78.9	83.5	76.3	84.2	76.9	7590	86.6
2004	6867.8	950.0	87.4	79.9	81.7	77.0	82.3	77.5	7715	87.8
2005	5850.7	950.0	84.5	80.4	83.5	77.7	70.3	76.8	6557	74.9
2006	6855.0	950.0	84.0	80.8	83.6	78.3	82.4	77.3	7317	83.5
2007	6756.3	950.0	83.4	81.0	83.3	78.7	81.2	77.7	7275	83.0
2008	6355.3	950.0	83.8	81.2	83.7	79.1	76.4	77.5	6888	78.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1995 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure	1386			1196	37	61
C. Inspection, maintenance or repair combined with refuelling				95		
D. Inspection, maintenance or repair without refuelling				32		
E. Testing of plant systems or component:						
K. Load-following (frequency control reserve shutdown due to reduced energy demand)			510			
Subtotal	1386	0	510	1323	37	61
Total	1896			1421		

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

System	2008 Hours Lost	1995 to 2008 Average Hours Lost Per Year
15. Reactor Cooling System:		3
16. Steam generation system:		13
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries:		10
32. Feedwater and Main Steam System:		0
35. All other I&C Systems:		0
41. Main Generator System:		2
42. Electrical Power Supply System:		2
XX. Miscellaneous Systems:		1
Total	0	32

# GB-18A DUNGENESS-B1

Operator: BE (BRITISH ENERGY)

Contractor: APC (ATOMIC POWER CONSTRUCTION LTD.)

## 1. Station Details

Type: GCR  
 Net Reference Unit Power  
 at the beginning of 2008: 545.0 MW(e)  
 Design Net Capacity: 607.0 MW(e)  
 Design Discharge Burnup: 19000 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 1999.9 GW(e).h  
 Energy Availability Factor: 43.5%  
 Load Factor: 43.4%  
 Operating Factor: 51.0%  
 Energy Unavailability Factor: 56.5%  
 Total Off-line Time: 4293 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	375.6	339.1	205.3	0.0	0.0	136.1	34.8	0.0	0.0	149.2	373.3	386.4	1999.9
EAF (%)	92.6	89.0	51.2	-0.1	0.0	38.3	10.2	0.0	0.0	40.1	99.4	99.8	43.5
UCF (%)	92.6	89.0	51.2	-0.1	0.0	38.3	10.2	0.0	0.0	40.1	99.4	99.8	43.5
LF (%)	92.6	92.6	50.6	0.0	0.0	36.3	9.0	0.0	0.0	38.5	99.7	99.9	43.4
OF (%)	100.0	103.6	86.3	0.0	0.0	59.4	14.8	0.0	0.0	51.4	100.0	100.0	51.0
EUF (%)	7.4	11.0	48.8	100.1	100.0	61.7	89.8	100.0	100.0	59.9	0.6	0.2	56.5
PUF (%)	5.4	5.9	24.8	99.6	1.0	12.8	83.3	66.3	1.0	0.4	0.1	0.1	25.0
UCLF (%)	2.0	5.1	24.0	0.6	99.0	48.9	6.5	33.7	99.0	59.4	0.5	0.1	31.5
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. 2008 Summary of Operation

REASON FOR APRIL 08 RUP REVISION: FUEL CONSTRAINT.

## 5. Historical Summary

Date of Construction Start: 01 Oct 1965      Lifetime Generation: 71800.3 GW(e).h  
 Date of First Criticality: 23 Dec 1982      Cumulative Energy Availability Factor: 44.3%  
 Date of Grid Connection: 03 Apr 1983      Cumulative Load Factor: 43.6%  
 Date of Commercial Operation: 01 Apr 1985      Cumulative Unit Capability Factor: 46.2%  
    Cumulative Energy Unavailability Factor: 55.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	1826.2	450.0	64.8	64.8	62.8	62.8	61.9	61.9	4443	67.8
1986	1172.6	450.0	33.7	47.0	29.1	43.5	29.8	43.6	4447	50.9
1987	210.3	450.0	13.2	34.6	6.5	29.9	5.2	29.5	1179	13.2
1988	1233.9	450.0	45.5	37.5	33.3	30.8	31.4	30.0	3857	44.2
1989	647.2	412.0	43.8	38.7	24.8	29.6	18.0	27.6	2650	30.3
1990	758.0	360.0	26.3	36.9	26.3	29.1	24.1	27.1	5093	58.3
1991	2656.2	410.0	74.5	42.3	74.5	35.6	74.0	33.8	7329	83.9
1992	1052.3	441.0	27.5	40.3	27.4	34.5	26.7	32.8	2670	30.0
1993	3493.2	516.0	77.5	45.3	77.1	40.2	77.5	38.8	7138	81.7
1994	2385.7	555.0	51.5	46.0	49.2	41.4	49.2	40.1	4676	53.5
1995	873.7	555.0	18.2	42.9	18.2	38.8	17.9	37.6	1587	18.1
1996	2517.0	555.0	51.6	43.8	51.6	40.1	51.6	39.1	5311	60.5
1997	2078.2	555.0	42.9	43.7	42.9	40.3	42.6	39.4	4549	51.8
1998	2198.3	555.0	47.4	44.0	47.0	40.9	45.1	39.9	5716	65.1
1999	1584.2	555.0	33.0	43.2	33.0	40.3	32.5	39.3	4752	54.1
2000	409.6	555.0	8.4	40.7	8.4	38.0	8.4	37.1	1201	13.7
2001	3049.1	555.0	62.2	42.1	61.9	39.6	62.5	38.8	7108	80.9
2002	2167.6	555.0	45.6	42.3	45.5	40.0	44.6	39.1	5043	57.6
2003	2482.9	555.0	54.6	43.1	51.9	40.7	51.1	39.8	5212	59.5
2004	3082.5	555.0	63.8	44.2	63.8	42.0	63.2	41.2	6305	71.8
2005	2955.1	555.0	61.7	45.1	61.6	43.0	60.8	42.2	6039	68.9
2006	2453.8	555.0	51.7	45.5	51.6	43.4	51.2	42.6	5246	59.9
2007	2981.3	545.0	63.3	46.3	63.3	44.4	62.4	43.6	6447	73.6
2008	1999.9	520.0	43.5	46.2	43.5	44.3	43.4	43.6	4467	51.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					936	
B. Refuelling without a maintenance	820	1152		97	48	
C. Inspection, maintenance or repair combined with refuelling	1152	1776		606	88	
D. Inspection, maintenance or repair without refuelling				992	75	
E. Testing of plant systems or component:					5	6
H. Nuclear regulatory requirement				314		
J. Grid limitation, failure or grid unavailability						8
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					10	4
L. Human factor related					8	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.					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.					6	
Z. Others				114	41	
Subtotal	1972	2928	0	2123	1224	18
Total	4900			3365		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		33
13. Reactor Auxiliary System:		17
14. Safety Systems		1
15. Reactor Cooling System:		23
16. Steam generation system:		59
21. Fuel Handling and Storage Facilities		8
31. Turbine and auxiliaries:		65
32. Feedwater and Main Steam System		565
33. Circulating Water System		23
41. Main Generator System:		111
42. Electrical Power Supply System:		18
XX. Miscellaneous Systems		0
Total	0	923

## GB-18B DUNGENESS-B2

Operator: BE (BRITISH ENERGY)

Contractor: APC (ATOMIC POWER CONSTRUCTION LTD.)

### 1. Station Details

Type: GCR  
 Net Reference Unit Power  
 at the beginning of 2008: 545.0 MW(e)  
 Design Net Capacity: 607.0 MW(e)  
 Design Discharge Burnup: 18000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 1568.9 GW(e).h  
 Energy Availability Factor: 34.2%  
 Load Factor: 34.0%  
 Operating Factor: 38.3%  
 Energy Unavailability Factor: 65.8%  
 Total Off-line Time: 5404 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	137.4	246.2	220.5	362.6	379.8	222.3	0.0	0.0	0.0	0.0	0.0	0.0	1568.9
EAF (%)	35.5	64.6	56.3	96.9	98.2	60.0	0.0	0.0	0.0	0.0	0.0	0.0	34.2
UCF (%)	35.5	64.6	56.4	96.9	98.2	60.0	0.0	0.0	0.0	0.0	0.0	0.0	34.2
LF (%)	33.9	67.2	54.4	97.0	98.2	59.4	0.0	0.0	0.0	0.0	0.0	0.0	34.0
OF (%)	40.9	80.5	63.8	100.1	100.0	79.4	0.0	0.0	0.0	0.0	0.0	0.0	38.3
EUF (%)	64.5	35.4	43.7	3.1	1.8	40.0	100.0	100.0	100.0	100.0	100.0	100.0	65.8
PUF (%)	64.2	30.5	3.7	1.0	0.3	14.3	98.3	98.3	99.8	100.0	5.3	1.1	43.2
UCLF (%)	0.3	4.8	40.0	2.2	1.5	25.7	1.7	1.7	0.2	0.0	94.7	98.9	22.6
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. 2008 Summary of Operation

REASON FOR APRIL 08 RUP REVISION: FUEL CONSTRAINT.

### 5. Historical Summary

Date of Construction Start: 01 Oct 1965      Lifetime Generation: 74385.3 GW(e).h  
 Date of First Criticality: 04 Dec 1985      Cumulative Energy Availability Factor: 50.3%  
 Date of Grid Connection: 29 Dec 1985      Cumulative Load Factor: 50.4%  
 Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 50.6%  
    Cumulative Energy Unavailability Factor: 49.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		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	0.0
1990	726.0	360.0	23.1	12.6	23.1	12.6	23.1	12.6	4060	46.5
1991	1467.2	410.0	44.8	24.9	44.8	24.9	40.9	23.4	4295	49.2
1992	2360.4	441.0	62.0	35.9	61.9	35.9	59.9	34.2	6525	73.3
1993	2306.7	517.0	50.2	39.5	50.0	39.4	51.0	38.5	4672	53.5
1994	2568.3	555.0	57.1	43.3	57.0	43.2	53.0	41.6	5075	58.1
1995	773.8	555.0	16.1	38.5	16.1	38.4	15.9	37.0	1358	15.5
1996	3615.0	555.0	74.2	43.8	74.1	43.8	74.2	42.6	6882	78.3
1997	3327.3	555.0	68.5	47.1	68.3	47.0	68.3	46.0	6975	79.4
1998	1897.8	555.0	39.2	46.1	39.2	46.1	38.9	45.1	4390	50.0
1999	2123.3	555.0	30.6	44.5	30.6	44.5	43.6	45.0	5504	62.7
2000	1814.3	555.0	37.2	43.9	37.2	43.8	37.2	44.2	3767	42.9
2001	3007.4	555.0	62.1	45.4	61.1	45.3	61.7	45.7	6393	72.8
2002	2483.3	555.0	51.8	45.9	51.8	45.8	51.1	46.2	5135	58.6
2003	3747.3	555.0	78.3	48.3	76.0	48.0	77.1	48.4	7275	83.0
2004	3514.4	555.0	72.6	50.0	72.6	49.7	72.1	50.0	7138	81.3
2005	2739.7	555.0	57.7	50.4	57.7	50.2	56.4	50.4	5612	64.1
2006	2695.7	555.0	57.9	50.9	56.9	50.6	56.2	50.8	5712	65.2
2007	2875.7	545.0	60.9	51.4	60.9	51.2	60.2	51.3	6301	71.9
2008	1568.9	520.0	34.2	50.6	34.2	50.3	34.0	50.4	3356	38.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		52			565	
B. Refuelling without a maintenance	1128	1584		120	79	
C. Inspection, maintenance or repair combined with refuelling	2688			738	149	
D. Inspection, maintenance or repair without refuelling				841		
E. Testing of plant systems or component						22
H. Nuclear regulatory requirement				395		
J. Grid limitation, failure or grid unavailability					2	13
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				23		10
Z. Others				80	13	
Subtotal	3816	1636	0	2197	808	45
Total		5452			3050	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		52
13. Reactor Auxiliary Systems		1
15. Reactor Cooling System		21
16. Steam generation system	52	70
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		16
31. Turbine and auxiliaries		23
32. Feedwater and Main Steam System		230
33. Circulating Water System		79
41. Main Generator System		0
42. Electrical Power Supply System		7
XX. Miscellaneous Systems		48
Total	52	558

**GB-19A HARTLEPOOL-A1**

Operator: BE (BRITISH ENERGY)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

**1. Station Details**

Type: GCR

Net Reference Unit Power  
at the beginning of 2008: 595.0 MW(e)

Design Net Capacity: 625.0 MW(e)

Design Discharge Burnup: 24000 MW.d/t

Status at end of year: Operational

**2. Production Summary 2008**

Net Energy Production: 0.0 GW(e).h

Energy Availability Factor: -0.3%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.3%

Total Off-line Time: 8760 hours

**3. 2008 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	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
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	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.3
PUF (%)	1.4	1.4	1.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.2
UCLF (%)	98.6	102.1	98.6	97.6	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	98.1
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. 2008 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Oct 1968      Lifetime Generation: 73535.8 GW(e).h

Date of First Criticality: 24 Jun 1983      Cumulative Energy Availability Factor: 68.2%

Date of Grid Connection: 01 Aug 1983      Cumulative Load Factor: 65.9%

Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 68.3%

   Cumulative Energy Unavailability Factor: 31.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	1315.7	539.0	72.8	72.8	72.8	72.8	39.1	39.1	2983	45.2
1990	1698.7	487.0	40.1	54.5	40.1	54.5	39.9	39.5	3486	39.9
1991	2953.4	625.0	75.0	63.1	75.0	63.1	54.1	45.6	6791	77.7
1992	2910.4	510.0	63.6	63.2	63.5	63.2	64.1	50.4	6156	69.1
1993	4449.6	582.0	87.4	68.7	87.1	68.5	87.4	58.7	7802	89.3
1994	4296.6	605.0	81.7	71.1	81.4	71.0	81.3	62.9	7716	88.3
1995	3584.2	605.0	67.7	70.6	67.7	70.4	67.4	63.7	5937	67.6
1996	4518.0	605.0	85.7	72.7	85.6	72.5	85.0	66.6	7691	87.6
1997	4441.7	605.0	83.9	74.0	83.6	73.9	83.6	68.7	7644	87.0
1998	3892.3	605.0	73.5	74.0	73.5	73.8	73.2	69.1	7108	80.9
1999	5000.1	605.0	94.4	75.9	94.4	75.8	94.1	71.6	8369	95.3
2000	4757.3	605.0	89.5	77.1	88.6	77.0	89.5	73.2	8153	92.8
2001	4291.2	605.0	81.0	77.5	80.9	77.3	80.7	73.8	7301	83.1
2002	4627.8	605.0	87.5	78.2	87.5	78.1	87.3	74.8	7965	90.9
2003	4583.3	605.0	86.6	78.8	86.6	78.7	86.5	75.6	7856	89.7
2004	1942.7	605.0	36.9	76.1	36.9	75.9	36.6	73.1	3385	38.5
2005	2322.9	605.0	43.9	74.1	43.9	74.0	43.8	71.3	4829	55.1
2006	2378.9	605.0	45.9	72.5	45.9	72.4	45.5	69.8	4291	49.0
2007	3295.8	595.0	63.1	72.0	63.1	71.9	63.2	69.4	5680	64.8
2008	0.0	595.0	-0.3	68.3	-0.3	68.2	0.0	65.9	0	0.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		8784			732	
B. Refuelling without a maintenance outage					8	
C. Inspection, maintenance or repair combined with refuelling				505	23	
D. Inspection, maintenance or repair without refuelling				821		
E. Testing of plant systems or component					18	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				49		
H. Nuclear regulatory requirement				249	206	
J. Grid limitation, failure or grid unavailability					4	3
Z. Others				31	75	
Subtotal	0	8784	0	1655	1066	3
Total		8784			2724	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	8784	58
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		46
16. Steam generation system		213
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		51
32. Feedwater and Main Steam System		67
33. Circulating Water System		85
41. Main Generator System		147
42. Electrical Power Supply System		36
Total	8784	726

**GB-19B HARTLEPOOL-A2**

Operator: BE (BRITISH ENERGY)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

**1. Station Details**

Type: GCR  
 Net Reference Unit Power  
 at the beginning of 2008: 595.0 MW(e)  
 Design Net Capacity: 600.0 MW(e)  
 Design Discharge Burnup: 24000 MW.d/t  
 Status at end of year: Operational

**2. Production Summary 2008**

Net Energy Production: 0.0 GW(e).h  
 Energy Availability Factor: -0.3%  
 Load Factor: 0.0%  
 Operating Factor: 0.0%  
 Energy Unavailability Factor: 100.3%  
 Total Off-line Time: 8760 hours

**3. 2008 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	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
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	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.3
PUF (%)	1.6	1.7	1.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.3
UCLF (%)	98.4	101.9	98.3	97.6	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	98.0
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. 2008 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Oct 1968      Lifetime Generation: 69713.8 GW(e).h  
 Date of First Criticality: 09 Sep 1984      Cumulative Energy Availability Factor: 71.6%  
 Date of Grid Connection: 31 Oct 1984      Cumulative Load Factor: 69.9%  
 Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 71.8%  
    Cumulative Energy Unavailability Factor: 28.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	2234.8	421.0	100.0	100.0	100.0	100.0	80.6	80.6	4689	71.0
1990	3238.4	487.0	74.1	84.3	74.1	84.3	76.0	77.8	6796	77.8
1991	1855.9	625.0	55.1	71.6	55.1	71.6	34.0	58.7	3755	43.0
1992	4316.8	571.0	87.3	76.1	87.0	76.0	84.9	66.3	7923	89.0
1993	4264.6	582.0	84.9	78.1	83.8	77.8	83.8	70.2	7682	87.9
1994	3703.9	605.0	70.2	76.6	69.9	76.3	70.1	70.2	6612	75.7
1995	3750.7	605.0	70.9	75.7	70.9	75.4	70.6	70.2	6149	70.0
1996	4370.3	605.0	82.2	76.6	82.1	76.3	82.2	71.9	8131	92.6
1997	4127.9	605.0	77.9	76.8	77.2	76.4	77.7	72.6	6954	79.2
1998	4555.1	605.0	86.0	77.7	85.6	77.4	85.7	74.0	7973	90.8
1999	4472.5	605.0	84.4	78.4	83.6	78.0	84.2	75.0	7808	88.9
2000	4265.9	605.0	80.3	78.6	80.3	78.2	80.3	75.5	7463	85.0
2001	4635.9	605.0	87.5	79.3	87.5	79.0	87.2	76.4	8092	92.1
2002	4910.3	605.0	92.7	80.3	92.7	80.0	92.7	77.6	8383	95.7
2003	3488.4	605.0	66.4	79.3	66.4	79.1	65.8	76.8	6258	71.4
2004	3380.6	605.0	64.0	78.3	64.0	78.1	63.6	76.0	6016	68.5
2005	3651.6	605.0	69.2	77.8	69.2	77.5	68.9	75.5	6428	73.4
2006	2481.1	605.0	47.8	76.1	47.8	75.8	47.4	73.9	4455	50.9
2007	3593.6	595.0	69.1	75.7	69.1	75.5	68.9	73.6	6514	74.4
2008	0.0	595.0	-0.3	71.8	-0.3	71.6	0.0	69.9	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		8784			604	
B. Refuelling without a maintenance outage				11	4	
C. Inspection, maintenance or repair combined with refuelling				591	22	
D. Inspection, maintenance or repair without refuelling				579		
E. Testing of plant systems or component					6	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				46		
H. Nuclear regulatory requirement				105		53
Z. Others				77	8	
Subtotal	0	8784	0	1409	644	53
Total		8784			2106	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	8784	92
12. Reactor I&C Systems		18
13. Reactor Auxiliary System:		2
15. Reactor Cooling System:		57
16. Steam generation system:		10
21. Fuel Handling and Storage Facilities		3
31. Turbine and auxiliaries:		20
32. Feedwater and Main Steam System		164
33. Circulating Water System		84
41. Main Generator System:		120
42. Electrical Power Supply System:		16
Total	8784	586

**GB-20A HEYSHAM-A1**

Operator: BE (BRITISH ENERGY)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

**1. Station Details**

Type: GCR

Net Reference Unit Power  
at the beginning of 2008: 585.0 MW(e)

Design Net Capacity: 611.0 MW(e)

Design Discharge Burnup: 24000 MW.d/t

Status at end of year: Operational

**2. Production Summary 2008**

Net Energy Production: 0.0 GW(e).h

Energy Availability Factor: -0.3%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.3%

Total Off-line Time: 8760 hours

**3. 2008 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	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
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	103.6	99.9	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.3
PUF (%)	0.0	0.0	0.0	0.6	1.4	2.6	2.9	2.4	1.9	1.2	0.6	0.2	1.2
UCLF (%)	100.0	103.6	99.9	99.5	98.6	97.4	97.1	97.6	98.1	98.8	99.4	99.8	99.1
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. 2008 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Dec 1970      Lifetime Generation: 73264.6 GW(e).h

Date of First Criticality: 06 Apr 1983      Cumulative Energy Availability Factor: 70.6%

Date of Grid Connection: 09 Jul 1983      Cumulative Load Factor: 69.6%

Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 70.9%

   Cumulative Energy Unavailability Factor: 29.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	2351.6	420.0	100.0	100.0	100.0	100.0	84.8	84.8	5448	82.5
1990	1786.7	487.0	43.4	65.7	43.4	65.7	42.0	58.9	4096	46.9
1991	3826.2	621.0	86.4	74.7	86.4	74.7	70.5	63.9	7279	83.3
1992	2764.2	550.0	55.8	69.4	55.6	69.3	56.4	61.8	5981	67.2
1993	3638.2	555.0	75.0	70.6	74.3	70.4	75.0	64.7	6643	76.0
1994	4563.4	575.0	90.5	74.3	90.4	74.1	90.8	69.5	8128	93.0
1995	2808.9	575.0	55.9	71.4	55.9	71.3	55.6	67.4	4794	54.6
1996	4056.8	575.0	80.3	72.6	80.2	72.5	80.3	69.1	7674	87.4
1997	4298.8	575.0	85.4	74.1	84.5	73.9	85.1	71.0	7757	88.3
1998	3766.1	575.0	74.8	74.2	73.8	73.9	74.6	71.4	6950	79.1
1999	4549.8	575.0	90.4	75.8	89.7	75.4	90.1	73.2	7990	91.0
2000	4587.9	575.0	90.8	77.1	90.4	76.7	90.8	74.7	8230	93.7
2001	4034.6	575.0	78.0	77.2	77.6	76.8	79.9	75.2	6959	79.2
2002	4445.5	575.0	88.4	78.0	87.9	77.6	88.3	76.1	7921	90.4
2003	3746.2	575.0	74.8	77.8	74.4	77.4	74.4	76.0	6783	77.4
2004	2638.1	575.0	52.8	76.2	52.5	75.8	52.2	74.5	4951	56.4
2005	4033.1	575.0	80.1	76.4	80.1	76.1	80.1	74.8	7458	85.1
2006	3839.1	575.0	75.5	76.3	75.5	76.0	75.2	74.8	7229	82.5
2007	2498.5	585.0	49.1	74.8	49.1	74.5	48.8	73.4	4892	55.8
2008	0.0	585.0	-0.3	70.9	-0.3	70.6	0.0	69.6	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		8784			459	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling				768	51	
D. Inspection, maintenance or repair without refuelling				582		
E. Testing of plant systems or component					76	29
H. Nuclear regulatory requirement				93	58	17
J. Grid limitation, failure or grid unavailability					6	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						8
Z. Others				74	40	
Subtotal	0	8784	0	1517	692	54
Total		8784			2263	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories	8784	72
12. Reactor I&C Systems		6
15. Reactor Cooling System		55
16. Steam generation system		36
31. Turbine and auxiliaries		5
32. Feedwater and Main Steam System		23
33. Circulating Water System		123
41. Main Generator System		97
42. Electrical Power Supply System		31
XX. Miscellaneous Systems		8
Total	8784	456

**GB-20B HEYSHAM-A2**

Operator: BE (BRITISH ENERGY)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

**1. Station Details**

Type: GCR

Net Reference Unit Power  
at the beginning of 2008: 575.0 MW(e)

Design Net Capacity: 611.0 MW(e)

Design Discharge Burnup: 24000 MW.d/t

Status at end of year: Operational

**2. Production Summary 2008**

Net Energy Production: 0.0 GW(e).h

Energy Availability Factor: -0.3%

Load Factor: 0.0%

Operating Factor: 0.0%

Energy Unavailability Factor: 100.3%

Total Off-line Time: 8760 hours

**3. 2008 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	-3.6	0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
UCF (%)	0.0	-3.6	0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
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	103.6	99.7	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.3
PUF (%)	0.0	0.0	0.0	3.9	85.9	85.9	16.2	2.9	2.4	1.5	1.0	0.6	16.8
UCLF (%)	100.0	103.6	99.7	96.2	14.1	14.1	83.8	97.1	97.6	98.5	99.0	99.4	83.5
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. 2008 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Dec 1970      Lifetime Generation: 67362.3 GW(e).h

Date of First Criticality: 03 Jun 1984      Cumulative Energy Availability Factor: 68.8%

Date of Grid Connection: 11 Oct 1984      Cumulative Load Factor: 67.8%

Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 69.4%

   Cumulative Energy Unavailability Factor: 31.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	2505.6	470.0	100.0	100.0	100.0	100.0	90.4	90.4	5507	83.4
1990	3044.2	487.0	72.0	83.0	72.0	83.0	71.5	78.9	6690	76.6
1991	2647.7	622.0	65.0	75.2	64.6	75.0	48.7	65.8	5132	58.7
1992	3548.1	550.0	74.6	75.0	72.8	74.4	72.5	67.7	6951	78.1
1993	4336.5	555.0	88.5	77.9	88.1	77.4	89.4	72.4	7886	90.3
1994	3707.5	575.0	75.3	77.5	72.8	76.5	73.8	72.7	6652	76.1
1995	3367.5	575.0	66.9	75.8	66.9	75.0	66.7	71.7	5772	65.7
1996	3561.9	575.0	70.8	75.1	70.5	74.4	70.5	71.6	6836	77.8
1997	4443.3	575.0	88.2	76.7	86.9	75.9	88.0	73.5	8026	91.4
1998	4497.6	575.0	89.3	78.0	86.7	77.1	89.0	75.2	7999	91.1
1999	3712.7	575.0	73.8	77.6	71.7	76.5	73.5	75.0	6570	74.8
2000	4342.6	575.0	86.3	78.4	86.1	77.4	86.0	76.0	7946	90.5
2001	4495.0	575.0	90.8	79.4	89.3	78.3	89.0	77.0	8187	93.2
2002	3407.9	575.0	68.3	78.6	68.1	77.6	67.7	76.3	6313	72.1
2003	3647.0	575.0	72.5	78.1	72.5	77.2	72.4	76.1	6595	75.3
2004	1974.6	575.0	39.9	75.7	39.7	74.8	39.1	73.7	3805	43.3
2005	2112.6	575.0	43.7	73.7	43.7	72.9	41.9	71.7	3869	44.2
2006	3972.3	575.0	79.0	74.0	79.0	73.3	78.9	72.1	7735	88.3
2007	2981.6	575.0	59.4	73.2	59.4	72.5	59.2	71.4	6280	71.7
2008	0.0	575.0	-0.3	69.4	-0.3	68.8	0.0	67.8	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					560	
B. Refuelling without a maintenance				26	3	
C. Inspection, maintenance or repair combined with refuelling	1608			711	24	
D. Inspection, maintenance or repair without refuelling		7176		543		
E. Testing of plant systems or component				8	21	5
H. Nuclear regulatory requirement				63	79	60
J. Grid limitation, failure or grid unavailability					2	11
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				56	6	6
Z. Others				53	65	
Subtotal	1608	7176	0	1460	760	82
Total		8784			2302	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		157
12. Reactor I&C Systems		6
13. Reactor Auxiliary Systems		0
15. Reactor Cooling System		61
16. Steam generation system		11
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		109
32. Feedwater and Main Steam System		33
33. Circulating Water System		125
41. Main Generator System		11
42. Electrical Power Supply System		43
Total	0	557

**GB-22A HEYSHAM-B1**

Operator: BE (BRITISH ENERGY)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

**1. Station Details**

Type: GCR  
 Net Reference Unit Power  
 at the beginning of 2008: 615.0 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 2008**

Net Energy Production: 3879.3 GW(e).h  
 Energy Availability Factor: 72.0%  
 Load Factor: 72.0%  
 Operating Factor: 80.3%  
 Energy Unavailability Factor: 28.0%  
 Total Off-line Time: 1722 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	418.1	422.4	384.9	438.2	377.1	410.8	446.3	415.2	159.6	0.0	120.2	286.5	3879.3
EAF (%)	91.4	98.6	84.3	98.9	82.4	92.8	97.5	90.7	36.6	0.0	29.4	63.4	72.0
UCF (%)	91.4	98.6	84.3	99.0	82.4	92.8	97.5	90.7	36.6	0.0	29.4	63.4	72.0
LF (%)	91.4	102.2	84.1	99.1	82.4	92.8	97.5	90.7	36.0	0.0	27.1	62.6	72.0
OF (%)	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	37.9	0.0	37.1	86.3	80.3
EUF (%)	8.6	1.4	15.7	1.1	17.6	7.2	2.5	9.3	63.4	100.0	70.6	36.6	28.0
PUF (%)	6.0	0.0	6.6	0.0	8.0	3.3	1.4	5.5	62.5	100.0	38.8	5.7	19.9
UCLF (%)	2.6	1.4	9.1	1.1	9.6	4.0	1.1	3.8	0.9	0.0	31.8	30.9	8.0
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. 2008 Summary of Operation****5. Historical Summary**

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 79339.1 GW(e).h  
 Date of First Criticality: 23 Jun 1988      Cumulative Energy Availability Factor: 76.2%  
 Date of Grid Connection: 12 Jul 1988      Cumulative Load Factor: 74.8%  
 Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 76.9%  
    Cumulative Energy Unavailability Factor: 23.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	900.8	615.0	56.9	56.9	56.9	56.9	22.2	22.2	2319	35.1
1990	1487.0	615.0	27.7	40.3	27.7	40.3	27.7	25.3	3509	40.2
1991	1465.4	615.0	36.9	39.1	36.9	39.1	27.3	26.0	2786	31.9
1992	4096.0	615.0	80.2	50.2	74.8	48.7	74.8	39.2	7240	81.3
1993	4498.2	622.0	83.7	57.3	82.3	55.8	82.7	48.4	7376	84.4
1994	4181.1	625.0	79.1	61.1	75.6	59.3	76.6	53.3	7255	83.0
1995	5193.8	625.0	94.9	66.2	94.5	64.6	94.6	59.5	8286	94.3
1996	4707.4	625.0	85.7	68.7	85.0	67.2	85.7	62.9	7699	87.6
1997	4152.8	625.0	75.9	69.5	75.2	68.1	75.6	64.4	7105	80.9
1998	5019.4	625.0	91.7	71.8	90.5	70.4	91.4	67.2	8688	98.9
1999	4235.5	625.0	77.4	72.3	76.6	71.0	77.1	68.1	7212	82.1
2000	4415.3	625.0	80.4	73.0	79.9	71.8	80.4	69.2	7502	85.4
2001	5241.0	625.0	92.0	74.5	91.5	73.3	95.5	71.2	8534	97.2
2002	4414.0	625.0	80.8	75.0	80.8	73.9	80.6	71.9	7501	85.6
2003	5045.3	625.0	92.2	76.2	92.0	75.1	92.2	73.3	8444	96.4
2004	4115.7	625.0	75.4	76.1	75.3	75.1	75.0	73.4	7250	82.5
2005	4262.5	625.0	78.0	76.2	78.0	75.3	77.9	73.7	7317	83.5
2006	4604.0	625.0	85.2	76.7	85.2	75.9	85.1	74.3	8057	92.0
2007	4617.3	615.0	85.8	77.2	85.8	76.4	85.7	74.9	8006	91.4
2008	3879.3	615.0	72.0	76.9	72.0	76.2	72.0	74.8	7038	80.3



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1990 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				16	289	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	1488	264		671	24	
D. Inspection, maintenance or repair without refuelling				48		
E. Testing of plant systems or component				1	7	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				150		
H. Nuclear regulatory requirement				109		
J. Grid limitation, failure or grid unavailability						46
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						3
L. Human factor related					34	
Subtotal	1488	264	0	995	359	49
Total	1752			1403		

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

System	2008 Hours Lost	1990 to 2008 Average Hours Lost Per Year
15. Reactor Cooling System:		7
31. Turbine and auxiliaries:		132
32. Feedwater and Main Steam System		137
41. Main Generator System:		18
42. Electrical Power Supply System:		2
Total	0	296

**GB-22B HEYSHAM-B2**

Operator: BE (BRITISH ENERGY)

Contractor: NPC (NUCLEAR POWER CO. LTD.)

**1. Station Details**

Type: GCR

Net Reference Unit Power  
at the beginning of 2008: 615.0 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 2008**

Net Energy Production: 4709.3 GW(e).h

Energy Availability Factor: 86.7%

Load Factor: 86.9%

Operating Factor: 94.2%

Energy Unavailability Factor: 13.3%

Total Off-line Time: 508 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	213.6	421.0	457.1	375.2	455.7	332.2	347.3	451.5	384.4	457.6	378.3	435.4	4709.3
EAF (%)	47.9	97.6	99.2	84.0	98.8	74.7	75.9	97.9	86.1	99.1	84.7	94.4	86.7
UCF (%)	48.0	97.6	99.2	84.0	98.8	74.7	76.0	97.9	86.1	99.1	84.7	94.4	86.7
LF (%)	46.7	101.9	99.9	84.2	98.8	74.4	75.3	97.9	86.1	99.1	84.7	94.4	86.9
OF (%)	59.9	103.6	100.0	100.1	100.0	86.7	81.5	100.0	100.0	99.9	100.0	100.0	94.2
EUF (%)	52.1	2.4	0.8	16.0	1.2	25.3	24.1	2.1	13.9	0.9	15.3	5.6	13.3
PUF (%)	4.0	0.0	0.0	8.5	0.0	6.8	5.7	1.1	8.2	0.0	7.6	0.0	3.5
UCLF (%)	48.0	2.4	0.8	7.5	1.2	18.6	18.4	1.0	5.7	0.9	7.6	5.6	9.9
XUF (%)	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

UCLF replaces previously used UUF.

**4. 2008 Summary of Operation**

REASON FOR APRIL 08 RUP REVISION: TURBINE REFURBISHMENT.

**5. Historical Summary**

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 77857.2 GW(e).h

Date of First Criticality: 01 Nov 1988      Cumulative Energy Availability Factor: 76.2%

Date of Grid Connection: 11 Nov 1988      Cumulative Load Factor: 74.8%

Date of Commercial Operation: 01 Apr 1989      Cumulative Unit Capability Factor: 77.3%

   Cumulative Energy Unavailability Factor: 23.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	2590.4	615.0	74.4	74.4	74.4	74.4	63.8	63.8	4878	73.9
1990	784.0	615.0	14.9	40.5	14.9	40.5	14.6	35.8	1901	21.8
1991	2424.0	615.0	53.7	45.3	53.4	45.2	45.1	39.2	4453	51.0
1992	3486.5	615.0	66.4	51.0	64.7	50.5	63.7	45.8	6198	69.6
1993	4384.9	622.0	91.6	59.6	79.6	56.6	80.6	53.1	7125	81.6
1994	4435.3	625.0	84.0	63.9	80.7	60.9	81.2	58.1	7723	88.4
1995	4498.8	625.0	82.2	66.6	82.3	64.1	81.9	61.6	7249	82.5
1996	4265.4	625.0	78.6	68.2	78.4	65.9	77.7	63.7	7103	80.9
1997	4780.7	625.0	87.4	70.4	85.5	68.2	87.1	66.4	8021	91.3
1998	4209.7	625.0	77.0	71.1	76.2	69.0	76.7	67.5	7574	86.2
1999	2987.2	625.0	54.7	69.5	54.6	67.7	54.4	66.3	4987	56.8
2000	5001.9	625.0	91.1	71.4	90.5	69.6	91.1	68.4	8660	98.6
2001	4234.2	625.0	91.4	73.0	90.8	71.3	77.1	69.1	7103	80.9
2002	5010.3	625.0	91.5	74.3	91.5	72.8	91.5	70.7	8521	97.3
2003	4582.8	625.0	83.9	75.0	83.8	73.5	83.7	71.6	7712	88.0
2004	4244.2	625.0	77.5	75.1	77.5	73.8	77.3	72.0	7383	84.1
2005	5056.8	625.0	92.3	76.1	92.3	74.9	92.4	73.2	8564	97.8
2006	4816.7	625.0	89.1	76.9	89.1	75.7	89.0	74.1	8293	94.7
2007	4046.7	615.0	74.9	76.8	74.9	75.6	75.1	74.1	7104	81.1
2008	4709.3	620.0	86.7	77.3	86.7	76.2	86.9	74.8	8252	94.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		816		13	363	
B. Refuelling without a maintenance outage	168				6	
C. Inspection, maintenance or repair combined with refuelling				653	46	
D. Inspection, maintenance or repair without refuelling				40		
E. Testing of plant systems or component					9	
G. Major back-fitting, refurbishment or upgrading activities without refuelling				22		
H. Nuclear regulatory requirement				244		
J. Grid limitation, failure or grid unavailability					7	40
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						50
Subtotal	168	816	0	972	431	90
Total		984			1493	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		8
31. Turbine and auxiliaries	384	282
32. Feedwater and Main Steam System		34
41. Main Generator System	432	52
Total	816	376

## GB-16A HINKLEY POINT-B1

Operator: BE (BRITISH ENERGY)

Contractor: TNPG (THE NUCLEAR POWER GROUP LTD.)

### 1. Station Details

Type: GCR  
 Net Reference Unit Power  
 at the beginning of 2008: 430.0 MW(e)  
 Design Net Capacity: 625.0 MW(e)  
 Design Discharge Burnup: 27000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 2628.8 GW(e).h  
 Energy Availability Factor: 72.7%  
 Load Factor: 72.3%  
 Operating Factor: 79.2%  
 Energy Unavailability Factor: 27.3%  
 Total Off-line Time: 1825 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	289.4	258.4	186.9	156.1	100.1	234.2	0.0	240.4	278.2	304.5	295.7	284.9	2628.8
EAF (%)	90.4	86.1	60.3	55.0	36.4	79.9	0.0	79.2	94.1	99.6	99.8	93.1	72.7
UCF (%)	90.5	86.1	60.3	55.0	36.4	79.9	0.0	79.2	94.1	99.6	99.8	93.1	72.7
LF (%)	90.4	89.4	58.4	53.0	32.8	79.3	0.0	78.8	94.2	99.7	100.2	93.4	72.3
OF (%)	100.0	99.0	71.9	56.6	41.7	91.1	0.0	92.7	100.0	99.9	100.0	100.0	79.2
EUF (%)	9.6	13.9	39.7	45.0	63.6	20.1	100.0	20.8	5.9	0.4	0.2	6.9	27.3
PUF (%)	1.0	1.5	2.7	3.3	6.8	7.3	99.7	19.5	5.9	0.3	0.0	6.2	12.9
UCLF (%)	8.6	12.5	37.0	41.7	56.8	12.9	0.3	1.3	0.0	0.2	0.2	0.6	14.4
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

REASON FOR APRIL 08 RUP REVISION: RE-ASSESSED LOAD REDUCTION DUE TO BOILER ISSUES.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Sep 1967	<b>Lifetime Generation:</b>	109391.3 GW(e).h
<b>Date of First Criticality:</b>	24 Sep 1976	<b>Cumulative Energy Availability Factor:</b>	75.3%
<b>Date of Grid Connection:</b>	30 Oct 1976	<b>Cumulative Load Factor:</b>	76.2%
<b>Date of Commercial Operation:</b>	02 Oct 1978	<b>Cumulative Unit Capability Factor:</b>	75.9%
		<b>Cumulative Energy Unavailability Factor:</b>	24.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978			Data not provided							
1979	3079.8	400.0	79.4	79.4	73.5	73.5	88.1	88.1	6646	76.1
1980	2337.2	475.0	59.9	68.8	55.4	63.6	56.3	70.9	5394	61.7
1981	3441.6	520.0	78.5	72.5	74.3	67.7	74.3	72.2	7118	79.9
1982	2950.8	520.0	67.8	71.2	65.4	67.0	65.0	70.2	6000	68.7
1983	4083.0	520.0	88.3	74.8	86.6	71.2	89.9	74.4	8127	93.0
1984	3408.2	520.0	72.0	74.3	71.6	71.3	75.0	74.5	6589	75.4
1985	4263.0	520.0	82.3	75.5	82.2	72.9	93.8	77.4	8167	93.5
1986	3199.2	560.0	68.2	74.5	67.2	72.1	65.4	75.7	6110	69.9
1987	1838.0	560.0	39.6	70.2	38.8	68.0	36.9	70.9	3554	39.9
1988	2905.4	560.0	59.9	69.1	59.1	67.0	59.4	69.7	5370	61.5
1989	4195.3	560.0	85.6	70.7	85.5	68.8	85.8	71.2	7878	90.2
1990	3102.0	560.0	63.9	70.1	63.4	68.3	63.4	70.6	5732	65.6
1991	4601.9	560.0	94.3	72.1	94.3	70.5	94.1	72.5	8430	96.5
1992	3614.5	583.0	70.2	71.9	69.8	70.4	69.5	72.2	6565	73.7
1993	4843.3	585.0	94.8	73.6	94.6	72.2	94.0	73.8	8587	97.5
1994	4126.2	585.0	78.7	73.9	78.3	72.6	80.7	74.3	7342	84.0
1995	4812.5	610.0	90.1	75.0	89.6	73.7	89.8	75.3	7910	90.1
1996	4797.3	610.0	90.2	76.0	89.7	74.7	89.5	76.2	8418	95.8
1997	4185.7	610.0	78.4	76.1	78.3	74.9	78.1	76.3	7341	83.6
1998	4252.6	610.0	79.6	76.3	80.9	75.3	79.4	76.5	7740	88.1
1999	4045.2	610.0	75.8	76.3	77.0	75.4	75.5	76.4	7221	82.2
2000	3850.6	610.0	71.9	76.1	71.9	75.2	71.9	76.2	7208	82.1
2001	4802.0	610.0	87.0	76.6	87.0	75.7	89.6	76.9	8545	97.3
2002	4581.0	610.0	85.0	77.0	85.0	76.2	85.7	77.3	8021	91.6
2003	4076.4	610.0	74.8	76.9	74.8	76.1	76.3	77.2	7032	80.3
2004	4578.7	610.0	84.8	77.2	84.8	76.5	85.5	77.6	8091	92.1
2005	4580.6	610.0	85.2	77.5	85.2	76.8	85.7	77.9	8257	94.3
2006	3370.2	610.0	62.4	76.9	62.4	76.3	62.3	77.3	6200	70.8
2007	1877.4	430.0	45.2	76.0	45.2	75.4	44.9	76.3	5204	59.4
2008	2628.8	410.0	72.7	75.9	72.7	75.3	72.3	76.2	6935	79.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				14	466	
B. Refuelling without a maintenance outage					2	
C. Inspection, maintenance or repair combined with refuelling				120	24	
D. Inspection, maintenance or repair without refuelling	1080			325		
E. Testing of plant systems or component					1	
H. Nuclear regulatory requirement				142		
J. Grid limitation, failure or grid unavailability					4	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						1
Subtotal	1080	0	0	601	497	1
Total	1080			1099		

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		12
15. Reactor Cooling System		3
16. Steam generation system		158
31. Turbine and auxiliaries		136
32. Feedwater and Main Steam System		21
41. Main Generator System		83
42. Electrical Power Supply System		43
Total	0	469

## GB-16B HINKLEY POINT-B2

Operator: BE (BRITISH ENERGY)

Contractor: TNPG (THE NUCLEAR POWER GROUP LTD.)

### 1. Station Details

Type: GCR  
 Net Reference Unit Power  
 at the beginning of 2008: 430.0 MW(e)  
 Design Net Capacity: 625.0 MW(e)  
 Design Discharge Burnup: 27000 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 2709.9 GW(e).h  
 Energy Availability Factor: 74.0%  
 Load Factor: 74.6%  
 Operating Factor: 77.9%  
 Energy Unavailability Factor: 26.0%  
 Total Off-line Time: 1939 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	305.5	276.0	306.4	297.5	246.6	267.1	307.3	292.4	183.2	0.0	0.0	227.9	2709.9
EAF (%)	95.5	91.9	95.9	100.0	81.2	90.0	100.0	95.1	62.3	0.0	0.0	73.5	74.0
UCF (%)	95.5	91.9	95.9	100.0	81.2	90.0	100.0	95.1	62.3	0.0	0.0	73.5	74.0
LF (%)	95.5	95.5	95.8	100.9	80.8	90.5	100.8	95.9	62.1	0.0	0.0	74.7	74.6
OF (%)	100.0	103.6	100.0	100.1	85.1	100.0	100.0	100.0	63.1	0.0	0.0	83.6	77.9
EUF (%)	4.5	8.1	4.1	0.0	18.8	10.0	0.0	4.9	37.7	100.0	100.0	26.5	26.0
PUF (%)	0.0	3.7	0.2	0.0	4.2	8.4	0.0	4.9	37.7	100.0	100.0	25.3	23.5
UCLF (%)	4.5	4.4	3.9	0.0	14.6	1.6	0.0	0.0	0.0	0.0	0.0	1.2	2.5
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. 2008 Summary of Operation

REASON FOR APRIL 08 RUP REVISION: REASSESSED LOAD REDUCTION DUE TO BOILER ISSUES.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Sep 1967	<b>Lifetime Generation:</b>	104943.6 GW(e).h
<b>Date of First Criticality:</b>	01 Feb 1976	<b>Cumulative Energy Availability Factor:</b>	72.7%
<b>Date of Grid Connection:</b>	05 Feb 1976	<b>Cumulative Load Factor:</b>	71.4%
<b>Date of Commercial Operation:</b>	27 Sep 1976	<b>Cumulative Unit Capability Factor:</b>	73.9%
		<b>Cumulative Energy Unavailability Factor:</b>	27.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976			Data not provided							
1977	1044.0	400.0	74.6	74.6	74.6	74.6	29.9	29.9	2756	31.5
1978			Data not provided							
1979	1499.7	400.0	44.0	59.3	38.2	56.4	42.9	36.4	3512	40.2
1980	3008.9	475.0	71.3	63.8	69.3	61.2	72.5	49.9	6390	73.1
1981	2488.8	520.0	57.1	61.8	54.7	59.3	53.8	51.0	5054	56.8
1982	3155.1	520.0	73.6	64.5	69.8	61.6	69.5	55.1	6834	78.2
1983	3454.5	520.0	75.6	66.5	74.1	63.9	76.0	58.9	6839	78.3
1984	4393.5	520.0	89.6	70.1	89.4	67.8	96.7	64.8	8228	94.2
1985	3229.9	520.0	66.7	69.6	66.7	67.7	71.1	65.6	5950	68.1
1986	3497.3	560.0	81.2	71.1	75.1	68.6	72.5	66.5	7257	84.2
1987	2971.1	560.0	68.3	70.7	60.6	67.7	59.6	65.7	6333	71.1
1988	4268.2	560.0	91.1	72.8	86.6	69.6	87.2	67.9	8467	96.9
1989	2484.6	560.0	65.6	72.1	65.3	69.2	50.8	66.3	4896	56.0
1990	4463.5	560.0	92.4	73.8	91.2	71.1	91.2	68.4	8565	98.0
1991	2353.5	560.0	57.4	72.6	57.4	70.0	48.1	66.8	4432	50.7
1992	3902.0	583.0	76.6	72.9	76.3	70.5	75.1	67.4	7225	81.1
1993	3743.0	597.0	71.7	72.8	71.4	70.5	71.7	67.8	6575	75.3
1994	4852.2	610.0	91.5	74.0	91.1	71.9	91.1	69.3	8602	98.5
1995	4518.1	610.0	84.6	74.7	84.6	72.7	84.3	70.3	7411	84.4
1996	3119.9	610.0	58.9	73.8	59.1	71.9	58.2	69.6	5615	63.9
1997	4512.9	610.0	84.5	74.4	85.0	72.7	84.2	70.4	7958	90.6
1998	4738.9	610.0	88.7	75.1	88.3	73.5	88.4	71.3	8641	98.4
1999	4082.3	610.0	76.9	75.2	75.8	73.6	76.2	71.6	7402	84.3
2000	4189.4	610.0	78.9	75.4	78.9	73.9	78.2	71.9	7851	89.4
2001	4772.4	610.0	84.1	75.8	84.1	74.3	89.1	72.7	8406	95.7
2002	3257.3	610.0	61.2	75.2	61.2	73.8	61.0	72.2	6163	70.4
2003	4619.5	610.0	86.5	75.6	86.5	74.3	86.4	72.8	8575	97.9
2004	4150.5	610.0	77.7	75.7	77.7	74.4	77.5	73.0	8163	92.9
2005	3357.2	610.0	63.3	75.2	63.3	74.0	62.8	72.6	6544	74.7
2006	3132.9	610.0	61.5	74.7	59.8	73.5	59.4	72.1	6051	69.1
2007	1812.9	430.0	44.0	73.9	44.0	72.7	43.9	71.3	4806	54.9
2008	2709.9	410.0	74.0	73.9	74.0	72.7	74.6	71.4	6821	77.9



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				7	698	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	2016			104	17	
D. Inspection, maintenance or repair without refuelling				146		
E. Testing of plant systems or component				4	11	
H. Nuclear regulatory requirement				40	64	
J. Grid limitation, failure or grid unavailability					3	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					5	
Z. Others					12	
Subtotal	2016	0	0	301	813	0
Total	2016			1114		

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		31
12. Reactor I&C Systems		16
16. Steam generation system:		279
31. Turbine and auxiliaries		139
32. Feedwater and Main Steam System		136
33. Circulating Water System		1
41. Main Generator System:		67
42. Electrical Power Supply System:		12
XX. Miscellaneous Systems		3
Total	0	684

## GB-11A OLDBURY-A1

**Operator:** MEL (Magnox Electric Limited)

**Contractor:** TNPG (THE NUCLEAR POWER GROUP LTD.)

### 1. Station Details

**Type:** GCR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 217.0 MW(e)  
**Design Net Capacity:** 300.0 MW(e)  
**Design Discharge Burnup:** 5430 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 0.0 GW(e).h  
**Energy Availability Factor:** -0.3%  
**Load Factor:** 0.0%  
**Operating Factor:** 0.0%  
**Energy Unavailability Factor:** 100.3%  
**Total Off-line Time:** 8760 hours

### 3. 2008 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	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
<b>UCF (%)</b>	0.0	-3.6	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.3
<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	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<b>PUF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<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. 2008 Summary of Operation

REACTOR OUT OF SERVICE WHILE WAITING FOR NII GRAPHITE SAFETY CASE APPROVAL.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1962	<b>Lifetime Generation:</b>	58125.0 GW(e).h
<b>Date of First Criticality:</b>	01 Aug 1967	<b>Cumulative Energy Availability Factor:</b>	79.9%
<b>Date of Grid Connection:</b>	07 Nov 1967	<b>Cumulative Load Factor:</b>	77.0%
<b>Date of Commercial Operation:</b>	31 Dec 1967	<b>Cumulative Unit Capability Factor:</b>	80.3%
		<b>Cumulative Energy Unavailability Factor:</b>	20.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1967	0.0	217.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1968	0.0	217.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1969	0.0	217.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1970	2546.0	423.0	100.0	100.0	100.0	100.0	68.7	33.2	0	0.0
1971	3120.9	423.0	86.9	95.7	86.9	95.7	83.8	49.7	8759	99.4
1972	2872.9	420.0	76.0	90.9	76.0	90.9	78.3	56.7	8736	100.0
1973	2530.4	400.0	63.3	85.7	63.3	85.7	72.4	59.6	8704	99.6
1974	2710.0	400.0	74.9	84.0	74.9	84.0	77.6	62.5	8731	99.9
1975	2873.0	407.0	78.8	83.3	78.8	83.3	80.8	65.0	8693	99.5
1976	3017.0	416.0	80.2	82.9	80.2	82.9	81.5	67.1	8714	97.9
1977	3110.0	416.0	85.5	83.2	85.5	83.2	85.6	69.1	8736	100.0
1978	3067.0	416.0	84.5	83.3	84.5	83.3	84.4	70.6	8736	100.0
1979	3184.0	416.0	88.1	83.7	88.1	83.7	87.6	72.2	8736	100.0
1980	3296.0	416.0	86.2	83.9	86.2	83.9	90.7	73.7	8736	100.0
1981	3376.0	416.0	85.5	84.1	85.5	84.1	91.1	75.1	8904	100.0
1982	3434.0	416.0	86.0	84.2	86.0	84.2	94.5	76.4	8736	100.0
1983	3013.0	434.0	77.4	83.7	77.4	83.7	79.5	76.7	8566	98.1
1984	3041.0	434.0	77.7	83.3	77.7	83.3	80.2	76.9	8736	100.0
1985	3322.1	434.0	83.2	83.3	83.2	83.3	87.6	77.5	8701	99.6
1986	3308.6	434.0	87.0	83.5	85.0	83.4	87.3	78.1	8650	99.0
1987	3222.9	434.0	84.1	83.6	82.9	83.4	83.4	78.4	8904	100.0
1988	3375.2	434.0	90.8	83.9	85.9	83.5	89.0	78.9	8530	97.6
1989	2915.2	434.0	86.5	84.1	82.0	83.5	76.9	78.8	8644	98.9
1990	2915.1	434.0	76.1	83.7	76.1	83.1	76.9	78.7	8713	99.7
1991	3184.2	434.0	84.3	83.7	84.3	83.2	84.0	79.0	8736	100.0
1992	3412.1	434.0	88.6	83.9	88.6	83.4	88.3	79.4	8857	99.5
1993	3541.3	434.0	92.9	84.3	92.5	83.8	93.4	79.9	8736	100.0
1994	3486.8	434.0	91.6	84.6	91.6	84.1	92.0	80.4	8318	95.2
1995	1570.5	217.0	82.6	84.6	82.6	84.1	82.6	80.5	7861	89.7
1996	1548.8	217.0	81.3	84.5	81.3	84.0	81.3	80.5	7870	89.6
1997	1693.1	217.0	89.1	84.6	89.1	84.1	89.1	80.6	8722	99.6
1998	1532.3	217.0	80.6	84.5	80.6	84.0	80.6	80.6	7617	87.0
1999	1774.3	217.0	93.2	84.7	93.2	84.2	93.3	80.9	8420	96.1
2000	1641.4	217.0	86.1	84.7	86.1	84.2	86.1	81.0	7928	90.3
2001	1621.3	217.0	85.3	84.7	85.3	84.2	85.3	81.0	7668	87.5
2002	1715.0	217.0	90.1	84.8	90.1	84.3	90.2	81.2	8215	93.8
2003	1513.7	217.0	79.6	84.7	79.6	84.3	79.6	81.2	7438	84.9
2004	723.8	217.0	38.0	83.9	38.0	83.5	38.0	80.4	3430	39.0
2005	744.6	217.0	39.2	83.2	39.2	82.8	39.2	79.8	3997	45.6
2006	1106.0	217.0	58.2	82.8	58.2	82.4	58.2	79.4	5628	64.2
2007	0.0	217.0	0.0	81.5	0.0	81.1	0.0	78.2	0	0.0
2008	0.0	217.0	-0.3	80.3	-0.3	79.9	0.0	77.0	0	0.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				1	355	
B. Refuelling without a maintenance outage					2	
C. Inspection, maintenance or repair combined with refuelling				29		
D. Inspection, maintenance or repair without refuelling	8784			983		
E. Testing of plant systems or component				120		0
H. Nuclear regulatory requirement				31	7	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						4
Subtotal	8784	0	0	1164	364	4
Total	8784			1532		

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		16
12. Reactor I&C Systems		10
14. Safety Systems		0
15. Reactor Cooling System		33
16. Steam generation system		17
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		9
31. Turbine and auxiliaries		45
32. Feedwater and Main Steam System		10
35. All other I&C Systems		1
41. Main Generator System		150
42. Electrical Power Supply System		53
Total	0	346

## GB-11B OLDBURY-A2

**Operator:** MEL (Magnox Electric Limited)

**Contractor:** TNPG (THE NUCLEAR POWER GROUP LTD.)

### 1. Station Details

**Type:** GCR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 217.0 MW(e)  
**Design Net Capacity:** 300.0 MW(e)  
**Design Discharge Burnup:** 5470 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 1660.1 GW(e).h  
**Energy Availability Factor:** 87.1%  
**Load Factor:** 87.3%  
**Operating Factor:** 94.1%  
**Energy Unavailability Factor:** 12.9%  
**Total Off-line Time:** 519 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	130.9	143.7	155.1	149.5	152.8	145.2	121.9	56.8	141.4	156.4	151.5	155.0	1660.1
<b>EAF (%)</b>	81.1	95.0	96.0	95.7	94.7	92.9	75.5	36.0	90.5	96.9	97.0	96.0	87.1
<b>UCF (%)</b>	81.1	95.0	96.0	95.7	94.7	92.9	75.5	36.0	90.5	96.9	97.0	96.0	87.1
<b>LF (%)</b>	81.1	98.6	96.0	95.8	94.7	92.9	75.5	35.2	90.5	96.7	97.0	96.0	87.3
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	82.8	44.2	100.0	99.9	100.0	100.0	94.1
<b>EUF (%)</b>	18.9	5.0	4.0	4.3	5.3	7.1	24.5	64.0	9.5	3.1	3.0	4.0	12.9
<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>	18.9	5.0	4.0	4.3	5.3	7.1	24.5	64.0	9.5	3.1	3.1	4.0	12.9
<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. 2008 Summary of Operation

OLDBURY R2 REMAINED IN SERVICE WITH TURBINE 1 UNTIL 26 JULY. WHEN THE REACTOR WAS MANUALLY SHUTDOWN FOR A FUEL CHANNEL DEBRIS INVESTIGATION. THE REACTOR RETURNED TO SERVICE ON 18 AUGUST WITH TURBINE 2.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1962	<b>Lifetime Generation:</b>	62365.0 GW(e).h
<b>Date of First Criticality:</b>	01 Dec 1967	<b>Cumulative Energy Availability Factor:</b>	78.1%
<b>Date of Grid Connection:</b>	06 Apr 1968	<b>Cumulative Load Factor:</b>	79.1%
<b>Date of Commercial Operation:</b>	30 Sep 1968	<b>Cumulative Unit Capability Factor:</b>	78.1%
		<b>Cumulative Energy Unavailability Factor:</b>	21.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1968			Data not provided							
1969										
1970										
1971										
1972										
1973										
1974										
1975										
1976										
1977										
1978										
1979										
1980										
1981										
1982										
1983										
1984										
1985										
1986										
1987										
1988										
1989										
1990										
1991										
1992										
1993										
1994										
1995	1841.3	217.0	96.7	96.7	96.7	96.7	96.9	96.9	8613	98.3
1996	1790.9	217.0	94.0	95.3	94.0	95.3	94.0	95.4	8641	98.4
1997	1832.4	217.0	96.4	95.7	96.4	95.7	96.4	95.7	8618	98.4
1998	1883.1	217.0	98.8	96.5	98.8	96.5	99.1	96.6	8760	100.0
1999	1515.5	217.0	79.3	93.0	79.3	93.0	79.7	93.2	7036	80.3
2000	1951.6	217.0	98.6	94.0	98.6	94.0	102.4	94.7	8685	98.9
2001	1939.8	217.0	98.8	94.7	98.8	94.7	102.0	95.8	8715	99.5
2002	1705.7	217.0	87.8	93.8	87.8	93.8	89.7	95.0	7724	88.2
2003	1859.4	217.0	93.4	93.8	93.4	93.8	97.8	95.3	8187	93.5
2004	1686.4	217.0	88.5	93.2	88.5	93.2	88.5	94.6	8187	93.2
2005	776.5	217.0	40.9	88.5	40.9	88.5	40.9	89.8	3743	42.7
2006	0.0	217.0	0.0	81.1	0.0	81.1	0.0	82.3	0	0.0
2007	618.0	217.0	32.5	77.4	32.5	77.4	32.5	78.5	3178	36.3
2008	1660.1	217.0	87.1	78.1	87.1	78.1	87.3	79.1	8241	94.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		543			167	1
D. Inspection, maintenance or repair without refuelling				883		
H. Nuclear regulatory requirement				71		
Subtotal	0	543	0	954	167	1
Total		543			1122	

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems		11
15. Reactor Cooling System		4
16. Steam generation system		5
17. Safety I&C Systems (excluding reactor I&C)		10
21. Fuel Handling and Storage Facilities	543	11
31. Turbine and auxiliaries		62
32. Feedwater and Main Steam System		4
33. Circulating Water System		6
41. Main Generator System		2
42. Electrical Power Supply System		30
Total	543	164

**GB-24 SIZEWELL-B**

**Operator:** BE (BRITISH ENERGY)  
**Contractor:** PPC (PWR POWER PROJECTS)

**1. Station Details**

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1188.0 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 2008**

**Net Energy Production:** 9301.2 GW(e).h  
**Energy Availability Factor:** 89.2%  
**Load Factor:** 89.1%  
**Operating Factor:** 92.2%  
**Energy Unavailability Factor:** 10.8%  
**Total Off-line Time:** 687 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	880.8	823.9	442.7	395.3	834.6	843.8	875.6	874.2	777.7	879.8	787.6	885.1	9301.2
<b>EAF (%)</b>	99.6	99.6	50.5	47.0	94.4	98.7	99.1	98.9	91.1	99.4	92.2	100.0	89.2
<b>UCF (%)</b>	99.7	99.6	50.5	47.0	94.4	98.7	99.1	98.9	91.1	99.4	92.2	100.0	89.2
<b>LF (%)</b>	99.6	99.6	50.1	46.2	94.4	98.7	99.1	98.9	90.9	99.5	92.1	100.1	89.1
<b>OF (%)</b>	100.0	100.0	67.3	51.9	95.7	100.0	100.0	100.0	94.4	100.0	96.4	100.0	92.2
<b>EUF (%)</b>	0.4	0.4	49.5	53.0	5.6	1.3	0.9	1.1	8.9	0.6	7.8	0.0	10.8
<b>PUF (%)</b>	0.2	0.2	49.3	50.7	0.4	0.6	0.9	1.1	0.7	0.3	0.3	0.0	8.7
<b>UCLF (%)</b>	0.2	0.1	0.2	2.4	5.2	0.7	0.0	0.0	8.3	0.3	7.6	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. 2008 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 18 Jul 1988  
**Date of First Criticality:** 31 Jan 1995  
**Date of Grid Connection:** 14 Feb 1995  
**Date of Commercial Operation:** 22 Sep 1995

**Lifetime Generation:** 96043.7 GW(e).h  
**Cumulative Energy Availability Factor:** 86.4%  
**Cumulative Load Factor:** 84.4%  
**Cumulative Unit Capability Factor:** 86.5%  
**Cumulative Energy Unavailability Factor:** 13.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1995	0.0	1188.0	100.0	100.0	99.6	99.6	0.0	0.0	0	0.0
1996	8488.5	1188.0	81.3	86.0	81.4	85.9	81.3	61.0	7367	83.9
1997	8469.8	1188.0	81.4	84.0	81.5	84.0	81.2	69.6	6992	79.6
1998	10123.1	1188.0	97.3	88.0	97.4	88.0	97.0	77.9	8705	99.1
1999	7959.0	1188.0	76.5	85.4	76.5	85.4	76.3	77.5	7134	81.2
2000	8527.2	1188.0	81.7	84.7	81.6	84.7	81.7	78.3	7612	86.7
2001	9198.0	1188.0	77.4	83.5	77.2	83.5	88.1	79.8	7784	88.6
2002	9195.0	1188.0	88.9	84.3	88.5	84.2	88.4	81.0	7862	89.7
2003	8854.2	1188.0	89.3	84.9	88.7	84.7	85.1	81.5	7613	86.9
2004	9329.1	1188.0	89.4	85.4	89.4	85.2	89.4	82.3	8685	98.9
2005	8696.3	1188.0	83.9	85.2	83.9	85.1	83.6	82.5	7476	85.3
2006	8908.3	1188.0	85.2	85.2	85.2	85.1	85.2	82.7	7570	86.4
2007	10264.3	1188.0	98.5	86.3	98.5	86.2	98.5	84.0	8760	100.0
2008	9301.2	1188.0	89.2	86.5	89.2	86.4	89.1	84.4	8097	92.2



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1995 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					243	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	648	48		378	56	
E. Testing of plant systems or component					5	
H. Nuclear regulatory requirement				271		
Subtotal	648	48	0	649	306	0
Total	696			955		

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

System	2008 Hours Lost	1995 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		29
13. Reactor Auxiliary Systems		4
14. Safety Systems		61
15. Reactor Cooling Systems		6
16. Steam generation system		4
31. Turbine and auxiliaries		3
32. Feedwater and Main Steam System		23
41. Main Generator System		110
XX. Miscellaneous Systems		0
Total	0	240

# GB-23A TORNESS 1

Operator: BE (BRITISH ENERGY)

Contractor: NNC (NATIONAL NUCLEAR CORPORATION)

## 1. Station Details

Type: GCR  
 Net Reference Unit Power  
 at the beginning of 2008: 625.0 MW(e)  
 Design Net Capacity: 645.0 MW(e)  
 Design Discharge Burnup: 29500 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 4488.1 GW(e).h  
 Energy Availability Factor: 82.8%  
 Load Factor: 83.0%  
 Operating Factor: 92.6%  
 Energy Unavailability Factor: 17.2%  
 Total Off-line Time: 650 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	302.6	413.8	391.1	142.0	341.1	382.1	422.7	438.4	382.3	441.7	393.6	436.6	4488.1
EAF (%)	65.6	94.9	84.2	33.0	74.8	86.3	92.4	95.8	86.3	96.4	88.9	95.4	82.8
UCF (%)	65.6	94.9	86.0	33.0	74.9	88.7	94.4	95.8	87.0	96.4	88.9	95.4	83.4
LF (%)	65.1	98.5	84.1	32.1	74.6	86.3	92.4	95.8	86.3	96.4	88.9	95.4	83.0
OF (%)	71.8	103.6	100.0	45.5	90.5	100.0	100.0	100.0	100.0	99.9	100.0	100.0	92.6
EUF (%)	34.4	5.1	15.8	67.0	25.2	13.7	7.6	4.2	13.7	3.6	11.1	4.6	17.2
PUF (%)	1.8	1.8	9.7	60.4	0.1	7.9	3.9	0.6	8.8	0.8	8.6	0.9	8.7
UCLF (%)	32.6	3.3	4.3	6.6	25.0	3.4	1.7	3.5	4.2	2.8	2.5	3.6	7.9
XUF (%)	0.0	0.0	1.8	0.0	0.2	2.4	2.0	0.0	0.6	0.0	0.0	0.0	0.6

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

REASON FOR APRIL 08 RUP REVISION: CARBON DEPOSITION.

## 5. Historical Summary

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 74707.8 GW(e).h  
 Date of First Criticality: 25 Mar 1988      Cumulative Energy Availability Factor: 73.2%  
 Date of Grid Connection: 25 May 1988      Cumulative Load Factor: 68.9%  
 Date of Commercial Operation: 25 May 1988      Cumulative Unit Capability Factor: 75.2%  
    Cumulative Energy Unavailability Factor: 26.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	2287.1	638.0	92.5	92.5	69.1	69.1	66.2	66.2	4330	80.9
1989	2162.1	625.0	53.2	68.5	39.5	51.0	39.6	49.9	4582	52.4
1990	1938.4	625.0	35.7	56.0	35.7	45.1	35.5	44.4	3943	45.1
1991	2513.6	625.0	46.0	53.2	46.0	45.4	46.0	44.9	5011	57.4
1992	4532.9	632.0	81.7	59.5	81.7	53.4	80.6	52.8	7792	87.5
1993	3603.1	632.0	67.9	61.1	67.7	56.0	62.9	54.6	6358	70.2
1994	4329.9	632.0	86.7	64.9	79.5	59.6	78.4	58.2	7716	88.3
1995	4058.6	632.0	75.2	66.3	75.2	61.6	71.5	60.0	6867	76.5
1996	1178.1	632.0	96.6	69.8	96.6	65.7	21.2	55.5	2043	23.3
1997	4909.4	625.0	89.7	71.9	89.7	68.2	89.4	59.0	8050	91.6
1998	4297.9	625.0	78.6	72.5	78.6	69.1	78.3	60.8	7153	81.4
1999	5157.8	625.0	94.2	74.3	94.2	71.3	93.9	63.6	8737	99.5
2000	4376.8	625.0	79.7	74.8	79.7	71.9	79.7	64.9	8769	99.8
2001	3968.5	625.0	70.2	74.4	70.2	71.8	72.3	65.4	7613	86.7
2002	3761.9	625.0	69.6	74.1	68.7	71.6	68.7	65.6	6719	76.7
2003	4681.9	625.0	85.8	74.8	85.6	72.5	85.5	66.9	8347	95.3
2004	3921.8	625.0	71.7	74.7	71.7	72.4	71.4	67.2	6993	79.6
2005	4667.7	625.0	85.3	75.3	85.3	73.2	85.3	68.2	8372	95.6
2006	4000.9	625.0	76.7	75.3	73.3	73.2	73.1	68.5	7939	90.6
2007	3500.9	625.0	65.3	74.8	64.2	72.7	63.9	68.2	6234	71.2
2008	4488.1	615.0	83.4	75.2	82.8	73.2	83.0	68.9	8110	92.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		744			242	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling				655	33	
D. Inspection, maintenance or repair without refuelling				182		
E. Testing of plant systems or component					1	
H. Nuclear regulatory requirement				56		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						28
M. Governmental requirements or court decisions						16
Z. Others				3	30	
Subtotal	0	744	0	896	312	44
Total		744			1252	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		28
15. Reactor Cooling System		83
16. Steam generation system		6
31. Turbine and auxiliaries		22
32. Feedwater and Main Steam System		10
41. Main Generator System	744	44
42. Electrical Power Supply System		29
Total	744	222

## GB-23B TORNESS 2

Operator: BE (BRITISH ENERGY)

Contractor: NNC (NATIONAL NUCLEAR CORPORATION)

### 1. Station Details

Type: GCR  
 Net Reference Unit Power  
 at the beginning of 2008: 625.0 MW(e)  
 Design Net Capacity: 645.0 MW(e)  
 Design Discharge Burnup: 29500 MW.d/t  
 Status at end of year: Operational

### 2. Production Summary 2008

Net Energy Production: 4780.8 GW(e).h  
 Energy Availability Factor: 88.2%  
 Load Factor: 88.1%  
 Operating Factor: 96.7%  
 Energy Unavailability Factor: 11.8%  
 Total Off-line Time: 290 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	351.2	304.1	353.6	409.4	448.6	403.2	450.3	411.4	427.5	389.1	430.4	401.9	4780.8
EAF (%)	75.7	70.5	76.6	92.5	98.1	91.1	98.4	89.9	96.6	84.9	97.2	87.8	88.2
UCF (%)	75.7	70.5	76.6	92.5	98.1	92.0	99.0	89.9	97.1	84.9	97.2	87.8	88.4
LF (%)	75.5	69.9	76.0	92.5	98.1	91.1	98.4	89.9	96.6	85.0	97.2	87.8	88.1
OF (%)	94.5	76.4	88.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.7
EUF (%)	24.3	29.5	23.4	7.5	1.9	8.9	1.6	10.1	3.4	15.1	2.8	12.2	11.8
PUF (%)	8.0	1.7	4.6	5.7	0.2	7.8	0.4	7.9	0.7	7.1	0.7	7.2	4.4
UCLF (%)	16.3	27.8	18.8	1.9	1.7	0.3	0.6	2.2	2.3	8.0	2.1	5.0	7.2
XUF (%)	0.0	0.0	0.0	0.0	0.1	0.9	0.5	0.0	0.5	0.0	0.0	0.0	0.2

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

REASON FOR APRIL 08 RUP REVISION: CARBON DEPOSITION.

### 5. Historical Summary

Date of Construction Start: 01 Aug 1980      Lifetime Generation: 72779.2 GW(e).h  
 Date of First Criticality: 23 Dec 1988      Cumulative Energy Availability Factor: 73.2%  
 Date of Grid Connection: 03 Feb 1989      Cumulative Load Factor: 69.2%  
 Date of Commercial Operation: 03 Feb 1989      Cumulative Unit Capability Factor: 74.4%  
    Cumulative Energy Unavailability Factor: 26.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	3633.8	625.0	87.4	87.4	74.2	74.2	73.3	73.3	7068	89.1
1990	1948.3	625.0	36.1	60.5	36.1	54.2	35.7	53.6	4211	48.2
1991	2651.3	625.0	48.4	56.3	48.4	52.2	48.6	51.9	5068	58.0
1992	3732.7	625.0	67.0	59.1	67.0	56.1	67.1	55.8	6560	73.7
1993	4038.0	632.0	74.4	62.2	74.4	59.8	73.1	59.4	7168	82.1
1994	3478.1	632.0	71.2	63.8	65.5	60.8	62.8	59.9	6264	71.5
1995	4651.9	632.0	85.9	67.1	85.9	64.5	81.3	63.1	7909	87.4
1996	1571.3	632.0	96.2	70.8	96.2	68.5	28.3	58.7	2409	27.4
1997	4218.0	625.0	77.7	71.5	77.7	69.6	76.8	60.7	7181	81.8
1998	5094.4	625.0	93.7	73.8	93.7	72.0	92.8	64.0	8713	99.2
1999	4984.0	625.0	91.1	75.3	91.1	73.7	90.8	66.4	8588	97.8
2000	3936.1	625.0	71.7	75.0	71.7	73.6	71.7	66.8	7686	87.5
2001	4293.6	625.0	77.2	75.2	76.6	73.8	78.2	67.7	8476	96.5
2002	1945.6	625.0	37.0	72.5	35.7	71.1	35.5	65.4	3751	42.8
2003	3782.8	625.0	69.4	72.3	69.4	71.0	69.1	65.7	6874	78.5
2004	4083.0	625.0	74.6	72.4	74.6	71.2	74.4	66.2	7682	87.5
2005	4821.9	625.0	87.9	73.3	87.9	72.2	88.1	67.5	8570	97.8
2006	3297.0	625.0	64.4	72.8	60.5	71.5	60.2	67.1	6456	73.7
2007	4829.0	625.0	89.2	73.7	88.3	72.4	88.2	68.2	8480	96.8
2008	4780.8	615.0	88.4	74.4	88.2	73.2	88.1	69.2	8494	96.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					336	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling				622	38	
D. Inspection, maintenance or repair without refuelling				208		
G. Major back-fitting, refurbishment or upgrading activities without refuelling				22	24	
H. Nuclear regulatory requirement				48		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	
M. Governmental requirements or court decisions						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.				8		
Subtotal	0	0	0	908	402	18
Total	0			1328		

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		2
15. Reactor Cooling System:		262
16. Steam generation system:		28
17. Safety I&C Systems (excluding reactor I&C)		21
21. Fuel Handling and Storage Facilities		2
32. Feedwater and Main Steam System		6
42. Electrical Power Supply System:		12
Total	0	333

# GB-13A WYLFA 1

**Operator:** MEL (Magnox Electric 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3944.4 GW(e).h  
**Energy Availability Factor:** 91.6%  
**Load Factor:** 91.9%  
**Operating Factor:** 100.3%  
**Energy Unavailability Factor:** 8.4%  
**Total Off-line Time:** -24 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	359.3	319.0	355.3	328.2	355.1	303.0	314.9	305.1	303.7	328.9	314.0	357.8	3944.4
<b>EAF (%)</b>	98.6	93.3	97.5	93.0	97.4	85.9	86.4	83.7	86.1	90.2	89.0	98.1	91.6
<b>UCF (%)</b>	98.6	93.3	97.5	93.0	97.4	85.9	88.0	86.0	88.9	91.6	89.0	98.1	92.3
<b>LF (%)</b>	98.6	96.9	97.5	93.2	97.4	85.9	86.4	83.7	86.1	90.1	89.0	98.1	91.9
<b>OF (%)</b>	100.0	103.6	100.0	100.1	100.0	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.3
<b>EUF (%)</b>	1.4	6.7	2.5	7.0	2.6	14.1	13.6	16.3	13.9	9.8	11.0	1.9	8.4
<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>	1.4	6.7	2.5	7.0	2.6	14.1	12.0	14.0	11.1	8.4	11.0	1.9	7.7
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	1.6	2.3	2.8	1.4	0.0	0.0	0.7

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

DURING 2008 THERE WERE NO REACTOR OUTAGES.

## 5. Historical Summary

**Date of Construction Start:** 01 Sep 1963  
**Date of First Criticality:** 01 Nov 1969  
**Date of Grid Connection:** 24 Jan 1971  
**Date of Commercial Operation:** 01 Nov 1971

**Lifetime Generation:** 107229.0 GW(e).h  
**Cumulative Energy Availability Factor:** 71.1%  
**Cumulative Load Factor:** 71.5%  
**Cumulative Unit Capability Factor:** 71.6%  
**Cumulative Energy Unavailability Factor:** 28.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1971	684.7	990.0	47.2	47.2	47.2	47.2	47.2	47.2	1273	87.0
1972	3026.3	990.0	35.0	36.7	35.0	36.7	35.0	36.7	0	0.0
1973	2236.9	840.0	33.1	35.2	30.5	34.1	30.5	34.1	0	0.0
1974	4364.0	840.0	59.5	42.4	59.5	41.6	59.5	41.6	8568	98.1
1975	1583.0	840.0	21.6	37.6	21.6	37.0	21.6	37.0	4437	50.8
1976	4818.0	840.0	66.8	43.1	66.8	42.7	64.4	42.2	8633	97.0
1977	4984.0	840.0	73.5	47.9	70.0	46.9	67.9	46.2	8008	91.7
1978	3801.0	840.0	52.5	48.5	52.5	47.7	51.8	47.0	7739	88.6
1979	5200.0	840.0	74.9	51.7	74.9	50.9	70.9	49.8	8694	99.5
1980	5764.0	840.0	78.1	54.5	78.1	53.8	78.5	52.9	8609	98.5
1981	6234.0	840.0	83.2	57.3	83.2	56.7	83.3	55.9	8823	99.1
1982	6040.0	840.0	81.7	59.4	81.7	58.9	81.4	58.1	8700	98.5
1983	6296.0	840.0	83.9	61.4	83.9	60.9	85.8	60.4	8715	99.8
1984	6757.0	840.0	89.5	63.5	89.5	63.1	92.1	62.7	8728	99.9
1985	6682.5	840.0	88.5	65.2	88.4	64.8	91.1	64.7	8736	100.0
1986	4099.9	840.0	62.1	65.0	61.9	64.6	55.7	64.1	7939	90.6
1987	4499.4	840.0	59.1	64.7	58.8	64.3	60.2	63.9	8611	96.7
1988	6172.4	840.0	84.3	65.8	83.8	65.4	84.1	65.0	8530	97.6
1989	6614.0	840.0	86.9	66.9	86.9	66.6	89.6	66.4	8572	97.6
1990	6746.4	840.0	89.9	68.1	89.9	67.8	91.9	67.7	8549	97.9
1991	7451.3	840.0	91.5	69.3	89.7	68.8	101.5	69.3	8374	95.9
1992	7795.2	950.0	92.3	70.5	92.1	70.1	92.2	70.5	8904	100.0
1993	7215.2	950.0	87.0	71.3	86.8	70.9	86.9	71.4	8477	97.0
1994	6111.0	950.0	76.1	71.5	72.4	71.0	73.6	71.5	6933	79.4
1995	2928.8	475.0	69.7	71.5	69.7	70.9	70.4	71.4	6216	71.0
1996	3973.8	475.0	93.2	72.0	93.2	71.4	95.2	72.0	8438	96.1
1997	3534.8	490.0	81.9	72.2	81.9	71.7	82.3	72.2	7353	83.9
1998	3725.2	490.0	86.3	72.5	86.3	72.0	86.8	72.5	8079	92.2
1999	3130.3	490.0	72.7	72.5	72.7	72.0	72.9	72.6	7632	87.1
2000	1001.0	490.0	23.3	71.5	23.3	71.0	23.3	71.5	2460	28.0
2001	1306.5	490.0	30.4	70.6	30.4	70.1	30.4	70.6	3451	39.4
2002	4058.3	490.0	95.3	71.1	94.5	70.6	94.5	71.1	8541	97.5
2003	2916.0	980.0	68.2	71.1	67.9	70.6	67.9	71.1	6389	72.9
2004	4144.3	490.0	97.0	71.6	96.1	71.1	96.3	71.6	8784	100.0
2005	2967.9	490.0	69.7	71.5	69.1	71.0	69.1	71.5	7200	82.2
2006	3730.4	490.0	86.9	71.8	86.9	71.3	86.9	71.8	8598	98.2
2007	1569.9	490.0	36.6	71.2	36.6	70.7	36.6	71.2	4401	50.2
2008	3944.4	490.0	92.3	71.6	91.6	71.1	91.9	71.5	8784	100.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					564	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling				173	8	
D. Inspection, maintenance or repair without refuelling				775		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				95		
H. Nuclear regulatory requirement				17	8	
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	15
L. Human factor related					1	
Subtotal	0	0	0	1060	583	17
Total	0			1660		

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		31
13. Reactor Auxiliary System:		0
14. Safety Systems		3
15. Reactor Cooling System:		22
16. Steam generation system:		140
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		33
31. Turbine and auxiliaries		123
32. Feedwater and Main Steam System		42
33. Circulating Water System		0
41. Main Generator System:		0
42. Electrical Power Supply System:		7
Total	0	415



## GB-13B WYLFA 2

**Operator:** MEL (Magnox Electric 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 2080.9 GW(e).h  
**Energy Availability Factor:** 48.2%  
**Load Factor:** 48.5%  
**Operating Factor:** 62.0%  
**Energy Unavailability Factor:** 51.8%  
**Total Off-line Time:** 3333 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	327.0	286.9	336.3	81.7	0.0	0.0	0.0	49.8	145.4	283.2	260.2	310.4	2080.9
<b>EAF (%)</b>	89.7	83.5	92.2	23.1	0.0	0.0	0.0	13.7	41.2	77.7	73.8	85.1	48.2
<b>UCF (%)</b>	89.7	83.6	92.2	23.1	0.0	0.0	0.0	13.7	41.2	77.7	73.8	85.1	48.2
<b>LF (%)</b>	89.7	87.1	92.2	23.2	0.0	0.0	0.0	13.7	41.2	77.6	73.8	85.1	48.5
<b>OF (%)</b>	100.0	103.6	100.0	25.5	0.0	0.0	0.0	31.6	85.7	99.9	100.0	100.0	62.0
<b>EUF (%)</b>	10.3	16.5	7.8	76.9	100.0	100.0	100.0	86.3	58.8	22.3	26.2	14.9	51.8
<b>PUF (%)</b>	0.0	0.0	0.0	74.7	100.0	100.0	100.0	63.6	0.0	0.0	0.0	0.0	36.7
<b>UCLF (%)</b>	10.3	16.5	7.8	2.3	0.0	0.0	0.0	22.8	58.8	22.3	26.2	14.9	15.1
<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. 2008 Summary of Operation

STATUTORY OUTAGE COMMENCED ON 08 APRIL FOR A DURATION OF ABOUT 134 DAYS WHICH INCLUDED GUIDE TUBE ASSEMBLY INSPECTIONS AND REPAIRS. AUTOMATIC TRIP ON 23 AUGUST DUE TO TURBINE 4 AUTOMATIC VOLTAGE REGULATOR FAULT, RESULTING IN AN INVESTIGATION AND VARIOUS RETURN TO SERVICE TESTS. MANUAL TRIP ON 17 SEPTEMBER DUE TO LOSS OF ELECTRICAL SUPPLIES, DURATION OF OUTAGE OF ABOUT FOUR DAYS.

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Sep 1963	<b>Lifetime Generation:</b>	100655.0 GW(e).h
<b>Date of First Criticality:</b>	01 Sep 1970	<b>Cumulative Energy Availability Factor:</b>	69.2%
<b>Date of Grid Connection:</b>	21 Jul 1971	<b>Cumulative Load Factor:</b>	69.2%
<b>Date of Commercial Operation:</b>	03 Jan 1972	<b>Cumulative Unit Capability Factor:</b>	69.4%
		<b>Cumulative Energy Unavailability Factor:</b>	30.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	Data not provided									
1973	"									
1974	"									
1975	"									
1976	"									
1977	"									
1978	"									
1979	"									
1980	"									
1981	"									
1982	"									
1983	"									
1984	"									
1985	"									
1986	"									
1987	"									
1988	"									
1989	"									
1990	"									
1991	"									
1992	"									
1993	"									
1994	"									
1995	3765.9	475.0	90.5	90.5	90.5	90.5	90.5	90.5	8760	100.0
1996	3150.5	475.0	75.5	83.0	75.5	83.0	75.5	83.0	7445	84.8
1997	3979.4	490.0	92.7	86.3	92.7	86.3	92.7	86.3	8342	95.2
1998	3329.1	490.0	78.1	84.2	78.1	84.2	77.6	84.1	7128	81.4
1999	4035.4	490.0	93.8	86.1	93.0	86.0	94.0	86.1	8656	98.8
2000	887.0	490.0	20.6	75.1	20.6	75.0	20.6	75.0	2208	25.1
2001	1286.4	490.0	30.0	68.6	30.0	68.5	30.0	68.6	3198	36.5
2002	3417.2	490.0	80.0	70.0	79.5	69.9	79.6	69.9	7385	84.3
2003	3354.4	490.0	78.6	71.0	78.1	70.8	78.1	70.9	7544	86.1
2004	3247.0	490.0	75.4	71.4	75.4	71.3	75.4	71.3	7296	83.1
2005	3782.0	490.0	88.9	73.0	88.1	72.8	88.1	72.9	8645	98.7
2006	1932.6	490.0	45.0	70.7	45.0	70.5	45.0	70.5	6020	68.7
2007	3198.8	490.0	75.1	71.0	74.5	70.8	74.5	70.8	7871	89.9
2008	2080.9	490.0	48.2	69.4	48.2	69.2	48.5	69.2	5427	62.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		139			420	
B. Refuelling without a maintenance outage					7	
C. Inspection, maintenance or repair combined with refuelling				208		
D. Inspection, maintenance or repair without refuelling	3218			642		
E. Testing of plant systems or component					2	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				114		
H. Nuclear regulatory requirement					13	
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)						14
Subtotal	3218	139	0	964	442	16
Total		3357			1422	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		36
12. Reactor I&C Systems		12
14. Safety Systems		4
15. Reactor Cooling System		47
16. Steam generation system		188
17. Safety I&C Systems (excluding reactor I&C)		11
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries	36	84
32. Feedwater and Main Steam System		10
41. Main Generator System		4
42. Electrical Power Supply System	103	15
Total	139	412

# US-313 ARKANSAS ONE-1

**Operator:** ENTGARKS (Entergy Arkansas, Inc.)

**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 843.0 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 2008

**Net Energy Production:** 6124.0 GW(e).h  
**Energy Availability Factor:** 86.1%  
**Load Factor:** 82.7%  
**Operating Factor:** 86.0%  
**Energy Unavailability Factor:** 13.9%  
**Total Off-line Time:** 1226 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	640.2	332.6	639.8	611.7	611.5	610.8	626.2	626.0	612.7	515.6	0.0	296.9	6124.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.7	0.0	50.6	86.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.7	0.0	50.6	86.1
<b>LF (%)</b>	102.1	56.7	102.1	100.8	97.5	100.6	99.8	99.8	101.0	82.2	0.0	47.3	82.7
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.6	0.0	50.5	86.0
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.3	100.0	49.4	13.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.3	100.0	36.2	12.8
<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	13.3	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 06 Dec 1968  
**Date of First Criticality:** 06 Aug 1974  
**Date of Grid Connection:** 17 Aug 1974  
**Date of Commercial Operation:** 19 Dec 1974

**Lifetime Generation:** 185738.6 GW(e).h  
**Cumulative Energy Availability Factor:** 78.8%  
**Cumulative Load Factor:** 74.4%  
**Cumulative Unit Capability Factor:** 79.2%  
**Cumulative Energy Unavailability Factor:** 21.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	0.0	819.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1975	4898.4	797.0	67.7	70.2	67.7	70.2	70.2	64.7	6661	76.0
1976	3888.0	836.0	53.0	61.8	53.0	61.8	52.9	58.9	4966	56.5
1977	5103.1	836.0	69.7	64.4	69.7	64.4	69.7	62.4	6688	76.3
1978	5249.8	836.0	71.7	66.2	71.7	66.2	71.7	64.7	6676	76.2
1979	3323.4	836.0	45.4	62.1	45.4	62.1	45.4	60.9	4253	48.6
1980	3781.2	836.0	74.8	64.2	63.7	62.3	51.5	59.3	5570	63.4
1981	4900.8	836.0	72.5	65.4	72.5	63.8	66.9	60.4	6336	72.3
1982	3721.4	836.0	64.8	65.3	64.8	63.9	50.8	59.2	5671	64.7
1983	3220.6	836.0	48.3	63.4	48.3	62.2	44.0	57.5	4191	47.8
1984	4604.1	836.0	70.1	64.1	70.1	63.0	62.7	58.0	6150	70.0
1985	5190.4	836.0	78.3	65.4	78.3	64.3	70.9	59.2	6852	78.2
1986	3589.9	836.0	62.2	65.1	62.2	64.2	49.0	58.4	5446	62.2
1987	4763.3	836.0	88.2	66.9	88.2	66.0	65.0	58.9	7720	88.1
1988	3963.2	836.0	68.3	67.0	68.3	66.2	54.0	58.5	5996	68.3
1989	3377.0	836.0	67.1	67.0	67.1	66.2	46.1	57.7	5871	67.0
1990	4145.8	836.0	75.9	67.5	75.9	66.8	56.6	57.6	6437	73.5
1991	6540.5	836.0	91.3	68.9	91.3	68.3	89.3	59.5	7991	91.2
1992	5833.1	836.0	80.7	69.6	80.7	69.0	79.4	60.6	7088	80.7
1993	6126.5	836.0	85.9	70.4	85.9	69.8	83.7	61.8	7520	85.8
1994	7198.6	836.0	98.7	71.8	98.7	71.3	98.3	63.6	8643	98.7
1995	5978.2	836.0	85.6	72.5	85.6	72.0	81.6	64.5	7493	85.5
1996	6287.0	836.0	86.7	73.1	86.7	72.6	85.6	65.4	7613	86.7
1997	7251.1	836.0	99.6	74.3	99.6	73.8	99.0	66.9	8723	99.6
1998	6216.8	836.0	84.1	74.7	84.1	74.2	84.9	67.6	7364	84.1
1999	6714.7	836.0	90.3	75.3	90.3	74.9	91.7	68.6	7907	90.3
2000	6410.1	836.0	88.2	75.8	88.2	75.4	87.3	69.3	7748	88.2
2001	6875.5	836.0	91.8	76.4	91.8	76.0	93.9	70.2	8100	92.5
2002	6568.6	836.0	89.1	76.9	89.1	76.5	89.7	70.9	7820	89.3
2003	6794.3	836.0	91.8	77.4	91.8	77.0	92.8	71.7	8050	91.9
2004	6827.6	836.0	91.6	77.8	91.6	77.5	93.0	72.4	8045	91.6
2005	5743.2	840.0	77.4	77.8	77.4	77.5	78.1	72.6	6778	77.4
2006	7474.9	836.0	100.0	78.5	100.0	78.2	102.1	73.5	8760	100.0
2007	6882.8	843.0	92.8	79.0	92.8	78.6	93.2	74.1	8122	92.7
2008	6124.0	843.0	86.1	79.2	86.1	78.8	82.7	74.4	7558	86.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		98			594	
B. Refuelling without a maintenance outage					5	
C. Inspection, maintenance or repair combined with refuelling	1126			846		
D. Inspection, maintenance or repair without refuelling				138		
E. Testing of plant systems or component				3	2	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				55		
H. Nuclear regulatory requirement						46
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				56	4	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					2	
Subtotal	1126	98	0	1098	607	47
Total		1224			1752	

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		86
12. Reactor I&C Systems	98	33
13. Reactor Auxiliary System:		14
14. Safety Systems		27
15. Reactor Cooling System:		45
16. Steam generation system:		50
17. Safety I&C Systems (excluding reactor I&C)		21
31. Turbine and auxiliaries		110
32. Feedwater and Main Steam System		68
33. Circulating Water System		10
35. All other I&C Systems		1
41. Main Generator System:		84
42. Electrical Power Supply System:		38
XX. Miscellaneous Systems		0
Total	98	587

## US-368 ARKANSAS ONE-2

**Operator:** ENTERGY (ENTERGY NUCLEAR)

**Contractor:** CE (COMBUSTION ENGINEERING CO.)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 995.0 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 2008

**Net Energy Production:** 8060.4 GW(e).h  
**Energy Availability Factor:** 93.0%  
**Load Factor:** 92.2%  
**Operating Factor:** 93.0%  
**Energy Unavailability Factor:** 7.0%  
**Total Off-line Time:** 618 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	752.6	617.9	370.6	445.0	747.6	719.9	708.5	743.2	722.5	750.1	729.2	753.2	8060.4
<b>EAF (%)</b>	100.0	100.0	49.5	66.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.0
<b>UCF (%)</b>	100.0	100.0	49.5	66.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.0
<b>LF (%)</b>	101.7	89.2	50.1	62.1	101.0	100.5	95.7	100.4	100.9	101.3	101.6	101.8	92.2
<b>OF (%)</b>	100.0	100.0	49.4	66.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.0
<b>EUF (%)</b>	0.0	0.0	50.5	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
<b>PUF (%)</b>	0.0	0.0	50.5	33.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
<b>UCLF (%)</b>	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
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	06 Dec 1968	<b>Lifetime Generation:</b>	186114.9 GW(e).h
<b>Date of First Criticality:</b>	05 Dec 1978	<b>Cumulative Energy Availability Factor:</b>	83.0%
<b>Date of Grid Connection:</b>	26 Dec 1978	<b>Cumulative Load Factor:</b>	83.2%
<b>Date of Commercial Operation:</b>	26 Mar 1980	<b>Cumulative Unit Capability Factor:</b>	83.2%
		<b>Cumulative Energy Unavailability Factor:</b>	17.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	3646.6	884.0	80.2	80.2	73.5	73.5	60.8	60.8	4913	72.8
1981	4323.6	858.0	65.2	71.9	65.2	68.9	57.5	59.0	5622	64.2
1982	3807.5	858.0	57.9	66.9	57.9	65.0	50.7	56.0	5023	57.3
1983	4427.9	858.0	61.5	65.5	61.5	64.0	58.9	56.8	5380	61.4
1984	6203.6	858.0	84.7	69.5	84.7	68.4	82.3	62.1	7439	84.7
1985	4701.2	858.0	69.2	69.4	69.0	68.5	62.5	62.2	6040	68.9
1986	5314.3	858.0	71.6	69.8	71.6	68.9	70.7	63.4	6274	71.6
1987	6605.2	858.0	87.7	72.1	87.7	71.3	87.9	66.6	7678	87.6
1988	4952.9	858.0	66.8	71.5	66.8	70.8	65.7	66.5	5867	66.8
1989	5472.2	858.0	74.4	71.8	74.4	71.2	72.8	67.1	6514	74.4
1990	7129.6	858.0	93.8	73.8	93.8	73.3	94.9	69.7	8211	93.7
1991	6123.3	858.0	82.1	74.5	82.1	74.0	81.5	70.7	7187	82.0
1992	5504.8	858.0	72.8	74.4	72.8	73.9	73.0	70.9	6390	72.7
1993	7344.7	858.0	95.3	75.9	95.3	75.5	97.7	72.8	8346	95.3
1994	6724.9	858.0	88.0	76.7	88.0	76.3	89.5	73.9	7707	88.0
1995	5694.5	858.0	75.9	76.6	75.9	76.3	75.8	74.1	6644	75.8
1996	7063.9	858.0	91.6	77.5	91.6	77.2	93.7	75.2	8049	91.6
1997	6957.0	858.0	91.5	78.3	91.5	78.0	92.6	76.2	8013	91.5
1998	6877.3	858.0	91.3	79.0	91.3	78.7	91.5	77.0	7995	91.3
1999	6226.9	858.0	82.4	79.2	82.4	78.9	82.8	77.3	7219	82.4
2000	5265.3	858.0	69.2	78.7	69.2	78.4	69.9	76.9	6077	69.2
2001	7917.0	858.0	96.8	79.5	96.8	79.3	105.3	78.2	8498	97.0
2002	8002.2	858.0	93.1	80.1	93.1	79.9	106.5	79.5	8203	93.6
2003	7925.7	858.0	92.5	80.6	92.5	80.4	105.5	80.6	8156	93.1
2004	8627.6	1000.0	97.7	81.4	97.7	81.2	98.2	81.4	8580	97.7
2005	7959.5	1000.0	90.9	81.9	90.9	81.7	90.9	81.8	7966	90.9
2006	7765.4	998.0	89.0	82.2	89.0	82.0	88.8	82.1	7793	89.0
2007	8603.3	995.0	98.0	82.8	98.0	82.6	98.7	82.8	8584	98.0
2008	8060.4	995.0	93.0	83.2	93.0	83.0	92.2	83.2	8166	93.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		0			513	
B. Refuelling without a maintenance					13	
C. Inspection, maintenance or repair combined with refuelling	614			853		
D. Inspection, maintenance or repair without refuelling				129		
E. Testing of plant systems or component:	0			12	20	
J. Grid limitation, failure or grid unavailability						15
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	3	0
Z. Others					0	
Subtotal	614	0	0	994	549	15
Total	614			1558		

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		68
13. Reactor Auxiliary System:		20
14. Safety Systems		91
15. Reactor Cooling System:		148
16. Steam generation system:		26
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	0	45
32. Feedwater and Main Steam System		54
33. Circulating Water System		3
41. Main Generator System:		10
42. Electrical Power Supply System:		31
Total	0	503

# US-334 BEAVER VALLEY-1

**Operator:** FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 892.0 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 2008

**Net Energy Production:** 7945.0 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. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	682.2	606.1	667.0	655.9	677.2	647.8	666.9	671.2	650.9	679.0	658.7	682.0	7945.0
<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>	102.8	97.6	100.6	102.1	102.0	100.9	100.5	101.1	101.4	102.3	102.4	102.8	101.4
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 26 Jun 1970  
**Date of First Criticality:** 10 May 1976  
**Date of Grid Connection:** 14 Jun 1976  
**Date of Commercial Operation:** 01 Oct 1976

**Lifetime Generation:** 159659.2 GW(e).h  
**Cumulative Energy Availability Factor:** 72.3%  
**Cumulative Load Factor:** 68.9%  
**Cumulative Unit Capability Factor:** 72.3%  
**Cumulative Energy Unavailability Factor:** 27.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976	303.2	834.0	100.0	100.0	100.0	100.0	16.1	16.1	821	37.2
1977	2870.3	843.0	39.2	51.6	39.2	51.6	38.9	34.2	4312	49.2
1978	2481.4	800.0	35.4	44.6	35.4	44.6	35.4	34.7	3569	40.7
1979	1778.4	815.0	24.8	38.6	24.8	38.6	24.9	31.7	3498	39.9
1980	300.7	811.0	6.9	31.2	6.9	31.2	4.2	25.3	600	6.8
1981	4674.7	810.0	73.9	39.2	73.9	39.2	65.9	33.0	6444	73.6
1982	2717.4	810.0	41.7	39.6	41.7	39.6	38.3	33.8	3644	41.6
1983	4682.2	810.0	68.5	43.6	68.5	43.6	66.0	38.2	5976	68.2
1984	4756.8	810.0	71.8	47.0	71.8	47.0	66.9	41.7	6301	71.7
1985	5901.5	810.0	91.9	51.8	91.9	51.8	83.2	46.1	8046	91.8
1986	4784.2	810.0	70.7	53.7	70.7	53.7	67.4	48.2	6195	70.7
1987	5620.9	810.0	84.0	56.3	84.0	56.3	79.2	50.9	7320	83.6
1988	4993.6	810.0	79.6	58.2	79.6	58.2	70.2	52.5	6989	79.6
1989	3794.3	810.0	66.5	58.9	66.5	58.9	53.5	52.6	5822	66.5
1990	6167.1	810.0	92.2	61.2	92.2	61.2	86.9	55.0	8074	92.2
1991	3710.9	810.0	55.8	60.8	55.8	60.8	52.3	54.8	4883	55.7
1992	6298.4	810.0	93.6	62.9	93.6	62.9	88.5	56.9	8218	93.6
1993	4359.8	810.0	67.3	63.1	67.3	63.1	61.4	57.1	5891	67.2
1994	5504.4	810.0	79.9	64.0	79.9	64.0	77.6	58.3	6991	79.8
1995	5449.2	810.0	77.8	64.7	77.8	64.7	76.8	59.2	6813	77.8
1996	5698.1	810.0	81.3	65.6	81.3	65.6	80.1	60.3	7132	81.2
1997	4025.8	810.0	56.8	65.1	56.8	65.1	56.7	60.1	4972	56.8
1998	2829.3	810.0	40.4	64.0	40.4	64.0	39.9	59.2	3557	40.6
1999	6106.2	810.0	88.5	65.1	88.5	65.1	86.1	60.3	7746	88.4
2000	5883.0	810.0	84.6	65.9	84.6	65.9	82.7	61.3	7430	84.6
2001	5991.0	821.0	84.6	66.6	84.6	66.6	84.1	62.2	7407	84.6
2002	6989.9	821.0	97.0	67.8	97.0	67.8	97.2	63.5	8490	96.9
2003	5985.4	821.0	84.1	68.4	84.1	68.4	83.2	64.2	7359	84.0
2004	6678.5	821.0	92.4	69.3	92.4	69.3	92.6	65.3	8119	92.4
2005	7290.3	821.0	100.0	70.3	100.0	70.3	101.4	66.5	8760	100.0
2006	5828.6	851.0	79.6	70.6	79.6	70.6	78.2	66.9	6973	79.6
2007	7057.7	892.0	91.6	71.4	91.6	71.4	90.3	67.7	8017	91.5
2008	7945.0	892.0	100.0	72.3	100.0	72.3	101.4	68.9	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					671	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling				1172	5	
D. Inspection, maintenance or repair without refuelling				108		
E. Testing of plant systems or component:				9	20	
H. Nuclear regulatory requirement					118	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				21	184	2
Z. Others					2	
Subtotal	0	0	0	1310	1014	2
Total	0			2326		

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		7
13. Reactor Auxiliary System:		33
14. Safety Systems		19
15. Reactor Cooling System:		168
16. Steam generation system:		2
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries		18
32. Feedwater and Main Steam System		131
35. All other I&C Systems:		1
41. Main Generator System:		22
42. Electrical Power Supply System:		149
XX. Miscellaneous Systems:		58
Total	0	614

# US-412 BEAVER VALLEY-2

Operator: FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 846.0 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 2008

Net Energy Production: 6726.2 GW(e).h  
 Energy Availability Factor: 87.9%  
 Load Factor: 87.8%  
 Operating Factor: 88.2%  
 Energy Unavailability Factor: 12.1%  
 Total Off-line Time: 1040 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	646.2	605.3	646.8	255.3	115.3	636.4	659.6	662.5	605.6	566.8	652.2	674.1	6726.2
EAF (%)	100.0	100.0	100.0	40.4	22.9	100.0	100.0	100.0	100.0	88.5	100.0	100.0	87.9
UCF (%)	100.0	100.0	100.0	40.4	22.9	100.0	100.0	100.0	100.0	88.5	100.0	100.0	87.9
LF (%)	102.7	102.8	102.9	41.9	18.3	99.3	99.6	100.0	94.5	85.6	101.6	101.8	87.8
OF (%)	100.0	100.0	100.0	43.3	26.6	100.0	100.0	100.0	100.0	88.4	100.0	100.0	88.2
EUF (%)	0.0	0.0	0.0	59.6	77.1	0.0	0.0	0.0	0.0	11.5	0.0	0.0	12.1
PUF (%)	0.0	0.0	0.0	59.6	74.7	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	2.5	0.0	0.0	0.0	0.0	11.5	0.0	0.0	1.2
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 03 May 1974      Lifetime Generation: 126430.7 GW(e).h  
 Date of First Criticality: 04 Aug 1987      Cumulative Energy Availability Factor: 86.0%  
 Date of Grid Connection: 17 Aug 1987      Cumulative Load Factor: 82.4%  
 Date of Commercial Operation: 17 Nov 1987      Cumulative Unit Capability Factor: 86.0%  
    Cumulative Energy Unavailability Factor: 14.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	738.1	822.0	100.0	100.0	100.0	100.0	82.4	82.4	950	88.7
1988	6477.1	833.0	93.8	94.5	93.8	94.5	88.5	87.9	8224	93.6
1989	4557.1	833.0	71.7	83.7	71.7	83.7	62.5	75.9	6245	71.3
1990	4291.6	827.0	77.1	81.6	77.1	81.6	59.2	70.6	6734	76.9
1991	6762.2	820.0	99.5	85.9	99.5	85.9	94.1	76.2	8720	99.5
1992	5647.1	820.0	94.8	87.7	94.8	87.7	78.4	76.7	7342	83.6
1993	5212.7	820.0	77.3	86.0	77.3	86.0	72.6	76.0	6770	77.3
1994	7024.7	820.0	96.8	87.5	96.8	87.5	97.8	79.0	8481	96.8
1995	6047.0	820.0	87.0	87.4	87.0	87.4	84.2	79.7	7616	86.9
1996	4788.6	820.0	70.3	85.6	70.3	85.6	66.5	78.2	6169	70.2
1997	6158.7	820.0	86.6	85.7	86.6	85.7	85.7	79.0	7583	86.6
1998	1808.7	820.0	25.1	80.2	25.1	80.2	25.2	74.1	2179	24.9
1999	5752.5	820.0	81.7	80.4	81.7	80.4	80.1	74.6	7155	81.7
2000	6227.8	820.0	88.9	81.0	88.9	81.0	86.5	75.5	7804	88.8
2001	7191.7	831.0	99.4	82.3	99.4	82.3	99.8	77.3	8702	99.3
2002	6604.3	831.0	92.9	83.0	92.9	83.0	90.7	78.1	8133	92.8
2003	6637.0	831.0	91.8	83.6	91.8	83.6	91.2	79.0	8037	91.7
2004	7314.8	831.0	100.0	84.5	100.0	84.5	100.2	80.2	8784	100.0
2005	6680.0	831.0	93.3	85.0	93.3	85.0	91.8	80.9	8169	93.3
2006	6309.5	851.0	87.6	85.2	87.6	85.2	84.6	81.1	7673	87.6
2007	7473.2	846.0	100.0	85.9	100.0	85.9	100.8	82.1	8760	100.0
2008	6726.2	890.0	87.9	86.0	87.9	86.0	87.8	82.4	7744	88.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		102			462	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	935			611	3	
D. Inspection, maintenance or repair without refuelling				18		
E. Testing of plant systems or component				1	20	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					66	
Subtotal	935	102	0	630	557	0
Total	1037			1187		

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		15
12. Reactor I&C Systems		5
13. Reactor Auxiliary System:		41
14. Safety Systems	85	14
15. Reactor Cooling System:		263
16. Steam generation system:		26
17. Safety I&C Systems (excluding reactor I&C)		7
31. Turbine and auxiliaries:	17	23
32. Feedwater and Main Steam System		9
35. All other I&C Systems:		4
41. Main Generator System:		7
42. Electrical Power Supply System:		30
XX. Miscellaneous Systems:		11
Total	102	455

# US-456 BRAIDWOOD-1

Operator: EXELON (Exelon Generation)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1178.0 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 2008

Net Energy Production: 10462.9 GW(e).h  
 Energy Availability Factor: 100.0%  
 Load Factor: 101.1%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.0%  
 Total Off-line Time: 0 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	857.0	822.7	898.2	867.5	894.5	853.7	877.4	877.3	854.1	894.3	869.1	897.2	10462.9
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 (%)	97.8	100.3	102.6	102.3	102.1	100.7	100.1	100.1	100.7	102.0	102.3	102.4	101.1
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 31 Dec 1975      Lifetime Generation: 175471.3 GW(e).h  
 Date of First Criticality: 29 May 1987      Cumulative Energy Availability Factor: 87.5%  
 Date of Grid Connection: 12 Jul 1987      Cumulative Load Factor: 85.5%  
 Date of Commercial Operation: 29 Jul 1988      Cumulative Unit Capability Factor: 87.5%  
    Cumulative Energy Unavailability Factor: 12.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	3424.2	1105.0	91.7	91.7	91.7	91.7	82.0	82.0	3409	91.4
1989	4649.1	1120.0	62.3	71.0	62.3	71.0	47.4	57.7	5435	62.0
1990	8264.6	1120.0	89.1	78.5	89.1	78.5	84.2	68.6	7778	88.8
1991	5018.6	1120.0	59.4	72.9	59.4	72.9	51.2	63.5	5198	59.3
1992	7157.9	1120.0	81.4	74.8	81.4	74.8	72.8	65.6	7142	81.3
1993	8693.1	1120.0	92.1	78.0	92.1	78.0	88.6	69.9	8048	91.9
1994	7398.2	1120.0	79.8	78.3	79.8	78.3	75.4	70.7	6940	79.2
1995	6614.3	1120.0	71.7	77.4	71.7	77.4	67.4	70.3	6214	70.9
1996	7618.9	1120.0	80.5	77.8	80.5	77.8	77.4	71.1	7021	79.9
1997	8096.3	1120.0	84.0	78.4	84.0	78.4	82.5	72.3	7339	83.8
1998	7578.8	1118.0	79.9	78.6	79.9	78.6	77.4	72.8	6976	79.6
1999	9904.8	1120.0	99.1	80.4	99.1	80.4	101.0	75.3	8680	99.1
2000	9311.3	1103.0	94.9	81.5	94.9	81.5	96.1	76.9	8335	94.9
2001	9557.9	1168.0	94.0	82.5	94.0	82.5	97.7	78.5	8247	94.1
2002	10612.2	1161.0	100.0	83.7	100.0	83.7	104.1	80.3	8760	100.0
2003	10094.8	1161.0	95.3	84.5	95.3	84.5	99.3	81.6	8353	95.4
2004	9807.2	1161.0	94.5	85.1	94.5	85.1	96.2	82.5	8310	94.6
2005	10277.0	1185.0	98.5	85.9	98.5	85.9	99.0	83.5	8630	98.5
2006	9945.9	1178.0	95.4	86.5	95.4	86.5	96.4	84.2	8352	95.3
2007	9526.7	1178.0	93.1	86.8	92.7	86.8	92.3	84.7	8119	92.7
2008	10462.9	1178.0	100.0	87.5	100.0	87.5	101.1	85.5	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					286	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling				638		
D. Inspection, maintenance or repair without refuelling				123	0	
E. Testing of plant systems or component				1		
H. Nuclear regulatory requirement					21	
J. Grid limitation, failure or grid unavailability					4	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	6	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Subtotal	0	0	0	762	325	1
Total	0			1088		

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		4
14. Safety Systems		4
15. Reactor Cooling System:		7
16. Steam generation system:		22
17. Safety I&C Systems (excluding reactor I&C)		8
31. Turbine and auxiliaries		2
32. Feedwater and Main Steam System		18
41. Main Generator System:		159
42. Electrical Power Supply System:		12
XX. Miscellaneous Systems:		12
Total	0	248



# US-457 BRAIDWOOD-2

Operator: EXELON (Exelon Generation)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1152.0 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 2008

Net Energy Production: 9323.2 GW(e).h  
 Energy Availability Factor: 92.3%  
 Load Factor: 92.1%  
 Operating Factor: 92.3%  
 Energy Unavailability Factor: 7.7%  
 Total Off-line Time: 678 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	873.9	791.7	874.2	537.9	359.8	831.1	854.1	852.7	830.7	868.3	847.1	801.7	9323.2
EAF (%)	100.0	100.0	100.0	66.5	47.6	100.0	100.0	100.0	100.0	100.0	100.0	93.7	92.3
UCF (%)	100.0	100.0	100.0	66.5	47.6	100.0	100.0	100.0	100.0	100.0	100.0	93.7	92.3
LF (%)	102.0	98.7	102.1	64.8	42.0	100.2	99.6	99.5	100.2	101.3	102.0	93.5	92.1
OF (%)	100.0	100.0	100.0	66.5	47.6	100.0	100.0	100.0	100.0	100.0	100.0	93.7	92.3
EUF (%)	0.0	0.0	0.0	33.5	52.4	0.0	0.0	0.0	0.0	0.0	0.0	6.3	7.7
PUF (%)	0.0	0.0	0.0	33.5	52.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.2
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 31 Dec 1975      Lifetime Generation: 175986.6 GW(e).h  
 Date of First Criticality: 08 Mar 1988      Cumulative Energy Availability Factor: 90.5%  
 Date of Grid Connection: 25 May 1988      Cumulative Load Factor: 87.9%  
 Date of Commercial Operation: 17 Oct 1988      Cumulative Unit Capability Factor: 90.5%  
    Cumulative Energy Unavailability Factor: 9.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	1350.9	1097.0	81.9	81.9	81.9	81.9	66.6	66.6	1476	81.5
1989	7142.0	1120.0	86.9	86.0	86.9	86.0	72.8	71.7	7581	86.5
1990	6353.6	1120.0	78.8	82.8	78.8	82.8	64.8	68.6	6849	78.2
1991	6545.5	1120.0	75.7	80.6	75.7	80.6	66.7	68.0	6626	75.6
1992	8751.1	1120.0	95.1	84.0	95.1	84.0	89.0	73.0	8346	95.0
1993	7362.3	1120.0	81.5	83.5	81.5	83.5	75.0	73.4	7098	81.0
1994	6636.1	1120.0	74.1	82.0	74.1	82.0	67.6	72.5	6454	73.7
1995	9533.0	1120.0	98.1	84.2	98.1	84.2	97.2	75.9	8583	98.0
1996	8011.8	1120.0	84.1	84.2	84.1	84.2	81.4	76.6	7349	83.7
1997	8234.7	1120.0	86.5	84.5	86.5	84.5	83.9	77.4	7563	86.3
1998	9694.6	1118.0	97.7	85.8	97.7	85.8	99.0	79.5	8552	97.6
1999	9030.9	1120.0	92.3	86.3	92.3	86.3	92.0	80.6	8070	92.1
2000	9510.9	1103.0	94.6	87.0	94.6	87.0	98.1	82.0	8303	94.5
2001	9647.9	1122.0	96.7	87.7	96.7	87.7	99.0	83.3	8481	96.8
2002	9449.5	1154.0	92.5	88.1	92.5	88.1	94.3	84.1	8099	92.5
2003	9932.2	1154.0	95.1	88.6	95.1	88.6	98.3	85.0	8337	95.2
2004	10201.0	1129.0	99.7	89.3	99.7	89.3	102.7	86.1	8757	99.7
2005	9519.4	1177.0	94.1	89.5	94.1	89.5	92.3	86.5	8244	94.1
2006	9624.6	1152.0	95.2	89.9	95.2	89.9	95.4	87.0	8335	95.1
2007	10131.2	1152.0	100.0	90.4	99.4	90.4	100.4	87.7	8706	99.4
2008	9323.2	1152.0	92.3	90.5	92.3	90.5	92.1	87.9	8106	92.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		46			137	
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling	630			538		
D. Inspection, maintenance or repair without refuelling				77		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					18	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Subtotal	630	46	0	615	167	2
Total		676			784	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		12
14. Safety Systems		9
15. Reactor Cooling System:		3
21. Fuel Handling and Storage Facilities		8
31. Turbine and auxiliaries		0
32. Feedwater and Main Steam System		17
35. All other I&C Systems		5
41. Main Generator Systems		12
42. Electrical Power Supply System:		61
XX. Miscellaneous Systems	46	
Total	46	127

## US-259 BROWNS FERRY-1

**Operator:** TVA (TENNESSEE VALLEY AUTHORITY)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1065.0 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 2008

**Net Energy Production:** 8193.1 GW(e).h  
**Energy Availability Factor:** 87.6%  
**Load Factor:** 87.6%  
**Operating Factor:** 87.6%  
**Energy Unavailability Factor:** 12.4%  
**Total Off-line Time:** 1091 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	808.0	770.0	818.2	772.1	788.2	763.8	782.5	594.1	770.6	622.6	0.0	702.8	8193.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.6	100.0	78.2	0.0	92.7	87.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.6	100.0	78.2	0.0	92.7	87.6
<b>LF (%)</b>	102.0	103.9	103.4	100.7	99.5	99.6	98.8	75.0	100.5	78.6	0.0	88.7	87.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.6	100.0	78.1	0.0	92.6	87.6
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.4	0.0	21.8	100.0	7.3	12.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.8	100.0	4.2	10.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.4	0.0	0.0	0.0	3.1	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1967	<b>Lifetime Generation:</b>	69247.2 GW(e).h
<b>Date of First Criticality:</b>	17 Aug 1973	<b>Cumulative Energy Availability Factor:</b>	61.2%
<b>Date of Grid Connection:</b>	15 Oct 1973	<b>Cumulative Load Factor:</b>	58.1%
<b>Date of Commercial Operation:</b>	01 Aug 1974	<b>Cumulative Unit Capability Factor:</b>	61.2%
		<b>Cumulative Energy Unavailability Factor:</b>	38.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	2765.4	1065.0	85.8	85.8	85.8	85.8	70.7	70.7	3114	84.8
1975	1378.5	1065.0	14.8	35.8	14.8	35.8	14.8	31.3	1535	17.5
1976	1301.1	1065.0	13.9	26.7	13.9	26.7	13.9	24.1	2174	24.7
1977	5043.1	1065.0	54.1	34.7	54.1	34.7	54.1	32.9	5817	66.4
1978	5817.8	1065.0	62.4	41.0	62.4	41.0	62.4	39.5	7042	80.4
1979	7495.7	1065.0	80.3	48.2	80.3	48.2	80.3	47.1	7918	90.4
1980	6061.3	1065.0	73.5	52.2	73.3	52.2	64.8	49.8	6376	72.6
1981	4405.3	1065.0	51.0	52.0	51.0	52.0	47.2	49.5	4435	50.6
1982	7880.9	1065.0	91.2	56.7	91.2	56.7	84.5	53.6	7967	90.9
1983	2175.5	1065.0	26.5	53.5	26.5	53.5	23.3	50.4	2316	26.4
1984	7848.5	1065.0	90.3	57.0	90.3	57.0	83.9	53.6	7930	90.3
1985	1603.0	1065.0	74.9	57.4	74.9	57.4	69.7	54.0	1626	75.3
1986	Data not available - Long-term shutdown									
1987	"									
1988	"									
1989	"									
1990	"									
1991	"									
1992	"									
1993	"									
1994	"									
1995	"									
1996	"									
1997	"									
1998	"									
1999	"									
2000	"									
2001	"									
2002	"									
2003	"									
2004	"									
2005	"									
2006	"									
2007	4535.3	1065.0	85.4	58.9	85.4	58.9	82.9	55.5	4452	86.7
2008	8193.1	1065.0	87.6	61.2	87.6	61.2	87.6	58.1	7693	87.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1973 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		174			140	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	914			456		
D. Inspection, maintenance or repair without refuelling				52		
E. Testing of plant systems or component				0	11	
H. Nuclear regulatory requirement				1		0
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					368	
L. Human factor related					2	
Subtotal	914	174	0	509	524	0
Total		1088			1033	

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

System	2008 Hours Lost	1973 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		7
13. Reactor Auxiliary Systems		10
14. Safety Systems		4
15. Reactor Cooling System	151	40
31. Turbine and auxiliaries		28
32. Feedwater and Main Steam System	23	17
41. Main Generator System		3
42. Electrical Power Supply System		2
XX. Miscellaneous Systems		8
Total	174	119

## US-260 BROWNS FERRY-2

**Operator:** TVA (TENNESSEE VALLEY AUTHORITY)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 9429.9 GW(e).h  
**Energy Availability Factor:** 97.3%  
**Load Factor:** 97.2%  
**Operating Factor:** 97.3%  
**Energy Unavailability Factor:** 2.7%  
**Total Off-line Time:** 239 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	829.9	793.6	842.2	807.7	827.7	772.7	803.3	788.5	606.6	700.4	816.6	840.8	9429.9
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.0	86.4	100.0	100.0	97.3
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.0	86.4	100.0	100.0	97.3
<b>LF (%)</b>	101.0	103.3	102.7	101.6	100.8	97.2	97.8	96.0	76.3	85.3	102.6	102.4	97.2
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.0	86.3	100.0	100.0	97.3
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	13.6	0.0	0.0	2.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	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	13.6	0.0	0.0	1.2
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 May 1967	<b>Lifetime Generation:</b>	200469.2 GW(e).h
<b>Date of First Criticality:</b>	20 Jul 1974	<b>Cumulative Energy Availability Factor:</b>	78.7%
<b>Date of Grid Connection:</b>	28 Aug 1974	<b>Cumulative Load Factor:</b>	75.3%
<b>Date of Commercial Operation:</b>	01 Mar 1975	<b>Cumulative Unit Capability Factor:</b>	78.7%
		<b>Cumulative Energy Unavailability Factor:</b>	21.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	550.6	1065.0	7.0	7.0	7.0	7.0	7.0	7.0	517	7.0
1976	1567.2	1065.0	16.8	12.3	16.8	12.3	16.8	12.3	2547	29.0
1977	6225.0	1065.0	66.8	31.5	66.8	31.5	66.7	31.5	6963	79.5
1978	5547.5	1065.0	59.5	38.8	59.5	38.8	59.5	38.8	6032	68.9
1979	7441.4	1065.0	79.8	47.2	79.8	47.2	79.8	47.2	7593	86.7
1980	5618.4	1065.0	69.8	51.1	69.5	51.1	60.1	49.4	6073	69.1
1981	7471.9	1065.0	85.2	56.1	85.2	56.1	80.1	53.9	7452	85.1
1982	4450.9	1065.0	54.9	55.9	54.9	55.9	47.7	53.1	4778	54.5
1983	6385.6	1065.0	74.8	58.1	74.8	58.0	68.4	54.9	6514	74.4
1984	4044.4	1065.0	66.5	58.9	66.5	58.9	43.2	53.7	5844	66.5
1985	0.0	1065.0	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	1065.0	70.2	58.3	70.2	58.3	60.7	52.9	4125	70.1
1992	8388.8	1065.0	95.7	61.5	95.7	61.5	89.7	56.0	8401	95.6
1993	5776.8	1065.0	65.7	61.8	65.7	61.8	61.9	56.5	5753	65.7
1994	7345.2	1065.0	82.6	63.3	82.6	63.3	78.7	58.1	7234	82.6
1995	9197.0	1065.0	98.5	65.7	98.5	65.7	98.6	60.8	8629	98.5
1996	8046.3	1065.0	88.7	67.2	88.7	67.1	86.0	62.4	7795	88.7
1997	8372.9	1065.0	92.8	68.7	92.8	68.7	89.7	64.1	8130	92.8
1998	9301.0	1065.0	99.7	70.4	99.7	70.4	99.7	66.1	8730	99.7
1999	8586.3	1100.0	91.0	71.6	91.0	71.6	89.1	67.3	7985	91.2
2000	9733.5	1118.0	99.4	73.0	99.4	73.0	99.1	69.0	8727	99.4
2001	8414.6	1118.0	87.2	73.8	87.2	73.7	85.9	69.9	7636	87.2
2002	8911.3	1118.0	94.4	74.7	94.4	74.7	91.0	70.9	8269	94.4
2003	8369.2	1118.0	90.1	75.4	90.1	75.4	85.5	71.5	7888	90.0
2004	9786.0	1118.0	99.2	76.5	99.2	76.5	99.6	72.8	8715	99.2
2005	8802.2	1118.0	91.9	77.1	91.9	77.1	89.9	73.5	8052	91.9
2006	9232.6	1118.0	95.5	77.9	95.5	77.9	94.3	74.3	8365	95.5
2007	7606.6	1104.0	80.7	78.0	80.7	78.0	78.7	74.5	7229	82.5
2008	9429.9	1104.0	97.3	78.7	97.3	78.7	97.2	75.3	8545	97.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		101			175	
B. Refuelling without a maintenance outage					22	
C. Inspection, maintenance or repair combined with refuelling				906		
D. Inspection, maintenance or repair without refuelling	136			73	2	
E. Testing of plant systems or component				7	2	
H. Nuclear regulatory requirement						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					372	
Subtotal	136	101	0	986	573	0
Total		237			1559	

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems		26
13. Reactor Auxiliary System		10
14. Safety Systems		7
15. Reactor Cooling System		25
31. Turbine and auxiliaries		49
32. Feedwater and Main Steam System		9
35. All other I&C Systems		0
41. Main Generator System	101	10
42. Electrical Power Supply System		24
XX. Miscellaneous Systems		1
Total	101	166



## US-296 BROWNS FERRY-3

**Operator:** TVA (TENNESSEE VALLEY AUTHORITY)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7300.6 GW(e).h  
**Energy Availability Factor:** 76.8%  
**Load Factor:** 69.3%  
**Operating Factor:** 77.3%  
**Energy Unavailability Factor:** 23.2%  
**Total Off-line Time:** 1990 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	255.8	760.1	398.8	0.0	339.2	789.8	726.9	758.1	794.2	828.4	803.7	845.7	7300.6
<b>EAF (%)</b>	26.0	100.0	51.0	0.0	46.4	100.0	93.4	100.0	100.0	100.0	100.0	100.0	76.8
<b>UCF (%)</b>	26.0	100.0	51.0	0.0	46.4	100.0	93.4	100.0	100.0	100.0	100.0	100.0	76.8
<b>LF (%)</b>	31.1	98.8	48.6	0.0	37.1	89.2	79.4	82.8	89.7	90.5	90.6	92.4	69.3
<b>OF (%)</b>	33.5	100.0	56.0	0.0	46.4	100.0	93.4	100.0	100.0	100.0	100.0	100.0	77.3
<b>EUF (%)</b>	74.0	0.0	49.0	100.0	53.6	0.0	6.6	0.0	0.0	0.0	0.0	0.0	23.2
<b>PUF (%)</b>	0.0	0.0	49.0	100.0	53.6	0.0	6.6	0.0	0.0	0.0	0.0	0.0	17.5
<b>UCLF (%)</b>	74.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	01 Jul 1968	<b>Lifetime Generation:</b>	161103.3 GW(e).h
<b>Date of First Criticality:</b>	08 Aug 1976	<b>Cumulative Energy Availability Factor:</b>	80.6%
<b>Date of Grid Connection:</b>	12 Sep 1976	<b>Cumulative Load Factor:</b>	77.9%
<b>Date of Commercial Operation:</b>	01 Mar 1977	<b>Cumulative Unit Capability Factor:</b>	80.6%
		<b>Cumulative Energy Unavailability Factor:</b>	19.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	5850.9	1065.0	74.8	74.8	74.8	74.8	74.8	74.8	6499	88.5
1978	5554.3	1065.0	59.5	66.5	59.5	66.5	59.5	66.5	6225	71.1
1979	5482.5	1065.0	58.8	63.8	58.8	63.8	58.8	63.8	5704	65.1
1980	6936.1	1065.0	79.9	68.0	79.3	67.8	74.1	66.5	6949	79.1
1981	6264.8	1065.0	72.6	68.9	72.6	68.8	67.2	66.6	6358	72.6
1982	4892.8	1065.0	57.4	67.0	57.4	66.9	52.4	64.2	5022	57.3
1983	5394.3	1065.0	61.9	66.2	61.9	66.1	57.8	63.3	5417	61.8
1984	290.5	1065.0	5.7	58.5	5.7	58.4	3.1	55.6	503	5.7
1985	1526.5	1065.0	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	1065.0	79.5	59.1	79.5	59.0	70.4	56.1	810	79.4
1996	8803.5	1065.0	95.8	63.1	95.8	63.0	94.1	60.2	8412	95.8
1997	8523.4	1065.0	94.8	66.2	94.8	66.1	91.4	63.3	8302	94.8
1998	7884.9	1078.0	89.9	68.3	89.9	68.3	83.5	65.1	7863	89.8
1999	9730.6	1118.0	100.0	71.0	100.0	71.0	99.4	68.0	8760	100.0
2000	9097.4	1118.0	94.6	72.9	94.6	72.9	92.6	70.0	8311	94.6
2001	9803.4	1118.0	100.0	74.9	100.0	74.8	100.1	72.2	8760	100.0
2002	9260.1	1118.0	96.0	76.3	96.0	76.3	94.6	73.7	8407	96.0
2003	9325.7	1118.0	96.6	77.6	96.6	77.6	95.2	75.1	8463	96.6
2004	8701.8	1118.0	91.1	78.4	91.1	78.4	88.6	75.9	8000	91.1
2005	9153.7	1114.0	96.2	79.4	95.7	79.4	93.8	76.9	8384	95.7
2006	8638.8	1117.0	91.1	80.1	91.1	80.0	88.3	77.5	7974	91.0
2007	9086.1	1105.0	95.6	80.8	95.6	80.8	93.9	78.3	8372	95.6
2008	7300.6	1230.0	76.8	80.6	76.8	80.6	69.3	77.9	6794	77.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		494			191	
B. Refuelling without a maintenance outage					5	
C. Inspection, maintenance or repair combined with refuelling	1445			486	243	
D. Inspection, maintenance or repair without refuelling	48			25		
E. Testing of plant systems or component				4		
H. Nuclear regulatory requirement						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				3	15	
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. Others					1	
Subtotal	1493	494	0	518	458	2
Total		1987			978	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		14
13. Reactor Auxiliary System		10
14. Safety Systems		15
15. Reactor Cooling System		38
31. Turbine and auxiliaries		55
32. Feedwater and Main Steam System		22
41. Main Generator System	494	0
42. Electrical Power Supply System		19
XX. Miscellaneous Systems		1
Total	494	175

# US-325 BRUNSWICK-1

**Operator:** PROGENGC (Progress Energy Carolinas, Inc.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7030.6 GW(e).h  
**Energy Availability Factor:** 84.9%  
**Load Factor:** 85.3%  
**Operating Factor:** 84.9%  
**Energy Unavailability Factor:** 15.1%  
**Total Off-line Time:** 1326 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	713.8	649.4	286.8	7.4	705.0	686.3	707.6	703.0	689.1	716.8	453.0	712.5	7030.6
<b>EAF (%)</b>	100.0	100.0	45.3	4.6	100.0	100.0	100.0	100.0	100.0	100.0	67.9	100.0	84.9
<b>UCF (%)</b>	100.0	100.0	45.3	4.6	100.0	100.0	100.0	100.0	100.0	100.0	67.9	100.0	84.9
<b>LF (%)</b>	102.3	99.5	41.1	1.1	101.0	101.6	101.4	100.7	102.0	102.7	67.0	102.1	85.3
<b>OF (%)</b>	100.0	100.0	45.2	4.6	100.0	100.0	100.0	100.0	100.0	100.0	67.8	100.0	84.9
<b>EUF (%)</b>	0.0	0.0	54.7	95.4	0.0	0.0	0.0	0.0	0.0	0.0	32.1	0.0	15.1
<b>PUF (%)</b>	0.0	0.0	54.7	95.4	0.0	0.0	0.0	0.0	0.0	0.0	21.7	0.0	14.2
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	0.0	0.9
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	07 Feb 1970	<b>Lifetime Generation:</b>	161485.7 GW(e).h
<b>Date of First Criticality:</b>	08 Oct 1976	<b>Cumulative Energy Availability Factor:</b>	73.5%
<b>Date of Grid Connection:</b>	04 Dec 1976	<b>Cumulative Load Factor:</b>	71.1%
<b>Date of Commercial Operation:</b>	18 Mar 1977	<b>Cumulative Unit Capability Factor:</b>	73.8%
		<b>Cumulative Energy Unavailability Factor:</b>	26.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	2515.8	790.0	43.4	43.4	43.4	43.4	43.4	43.4	3920	53.4
1978	5122.9	790.0	74.1	60.1	74.1	60.1	74.0	60.0	7624	87.0
1979	3169.2	790.0	45.8	55.1	45.8	55.1	45.8	55.0	4778	54.5
1980	3939.2	790.0	69.7	58.9	69.7	58.9	56.8	55.5	6045	68.8
1981	2574.8	790.0	49.0	56.8	49.0	56.8	37.2	51.7	4155	47.4
1982	2935.4	790.0	62.9	57.9	62.9	57.9	42.4	50.1	5428	62.0
1983	1419.1	790.0	26.4	53.3	26.4	53.3	20.5	45.8	2116	24.2
1984	5037.7	790.0	81.4	56.9	79.8	56.7	72.6	49.2	6797	77.4
1985	1942.5	790.0	38.9	54.9	38.9	54.7	28.1	46.8	3247	37.1
1986	5973.8	790.0	92.2	58.6	92.2	58.5	86.3	50.8	8068	92.1
1987	4057.9	790.0	65.6	59.3	65.6	59.1	58.6	51.6	5651	64.5
1988	4458.4	790.0	74.5	60.6	74.5	60.4	64.2	52.6	6514	74.2
1989	4193.8	790.0	64.6	60.9	64.6	60.8	60.6	53.2	5568	63.6
1990	4340.3	790.0	68.4	61.4	68.4	61.3	62.7	53.9	5909	67.5
1991	4400.3	780.0	67.3	61.8	67.3	61.7	64.4	54.6	5849	66.8
1992	1874.5	767.0	28.3	59.8	28.3	59.7	27.8	53.0	2486	28.3
1993	0.0	767.0	0.0	56.3	0.0	56.2	0.0	49.9	0	0.0
1994	5956.3	767.0	88.6	58.1	88.6	58.0	88.7	52.0	7755	88.5
1995	5780.7	767.0	84.4	59.4	84.4	59.3	86.0	53.8	7391	84.4
1996	5708.2	767.0	88.6	60.9	85.3	60.6	84.7	55.3	7490	85.3
1997	6857.0	767.0	97.7	62.6	97.7	62.4	102.1	57.5	8558	97.7
1998	6360.4	820.0	91.4	64.0	89.9	63.7	88.5	59.0	7811	89.2
1999	6998.2	820.0	99.0	65.6	96.8	65.2	97.4	60.8	8481	96.8
2000	6746.5	820.0	92.5	66.8	92.5	66.4	93.7	62.2	8122	92.5
2001	7303.1	820.0	100.0	68.1	100.0	67.8	101.7	63.8	8760	100.0
2002	6697.3	820.0	89.9	69.0	89.9	68.7	93.2	65.0	7874	89.9
2003	7701.8	872.0	98.9	70.2	98.9	69.9	100.8	66.5	8653	98.8
2004	7093.4	872.0	90.5	71.0	89.4	70.7	92.6	67.5	7853	89.4
2005	7755.1	872.0	94.5	71.9	94.5	71.6	101.5	68.8	8275	94.5
2006	7190.8	938.0	86.8	72.5	86.8	72.2	87.5	69.5	7601	86.8
2007	7881.9	938.0	94.6	73.3	94.6	73.0	95.9	70.5	8290	94.6
2008	7030.6	938.0	84.9	73.8	84.9	73.5	85.3	71.1	7458	84.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		74			370	
B. Refuelling without a maintenance					39	
C. Inspection, maintenance or repair combined with refuelling	1092			1258		
D. Inspection, maintenance or repair without refuelling	156			482		
E. Testing of plant systems or component				6	67	
H. Nuclear regulatory requirement					5	
J. Grid limitation, failure or grid unavailability						4
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					12	19
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
Subtotal	1248	74	0	1746	493	26
Total		1322			2265	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		16
13. Reactor Auxiliary Systems		10
14. Safety Systems		26
15. Reactor Cooling Systems		65
21. Fuel Handling and Storage Facilities		6
31. Turbine and auxiliaries		35
32. Feedwater and Main Steam System	74	12
41. Main Generator Systems		96
42. Electrical Power Supply Systems		50
XX. Miscellaneous Systems		11
Total	74	327

## US-324 BRUNSWICK-2

**Operator:** PROGENGC (Progress Energy Carolinas, Inc.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 937.0 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 2008

**Net Energy Production:** 7854.2 GW(e).h  
**Energy Availability Factor:** 96.2%  
**Load Factor:** 95.4%  
**Operating Factor:** 96.2%  
**Energy Unavailability Factor:** 3.8%  
**Total Off-line Time:** 336 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	705.2	662.9	638.1	676.2	697.4	662.4	691.1	658.2	566.2	700.0	491.8	704.8	7854.2
<b>EAF (%)</b>	100.0	100.0	94.2	100.0	100.0	100.0	100.0	95.6	89.5	100.0	74.5	100.0	96.2
<b>UCF (%)</b>	100.0	100.0	94.2	100.0	100.0	100.0	100.0	95.6	89.5	100.0	74.5	100.0	96.2
<b>LF (%)</b>	101.2	101.7	91.7	100.2	100.0	98.2	99.1	94.4	83.9	100.4	72.8	101.1	95.4
<b>OF (%)</b>	100.0	100.0	94.2	100.0	100.0	100.0	100.0	95.6	89.4	100.0	74.5	100.0	96.2
<b>EUF (%)</b>	0.0	0.0	5.8	0.0	0.0	0.0	0.0	4.4	10.5	0.0	25.5	0.0	3.8
<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	5.8	0.0	0.0	0.0	0.0	4.4	10.5	0.0	25.5	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	07 Feb 1970	<b>Lifetime Generation:</b>	162014.1 GW(e).h
<b>Date of First Criticality:</b>	20 Mar 1975	<b>Cumulative Energy Availability Factor:</b>	72.5%
<b>Date of Grid Connection:</b>	29 Apr 1975	<b>Cumulative Load Factor:</b>	69.0%
<b>Date of Commercial Operation:</b>	03 Nov 1975	<b>Cumulative Unit Capability Factor:</b>	72.8%
		<b>Cumulative Energy Unavailability Factor:</b>	27.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	706.8	804.0	93.2	93.2	93.2	93.2	58.8	58.8	1364	93.2
1976	2486.6	789.0	35.8	44.3	35.8	44.3	35.9	39.3	4911	55.9
1977	2436.6	790.0	35.3	40.1	35.3	40.1	35.2	37.4	4872	55.6
1978	4794.6	790.0	69.3	49.3	69.3	49.3	69.3	47.4	7018	80.1
1979	3652.1	790.0	52.8	50.1	52.8	50.1	52.8	48.7	5741	65.5
1980	1864.6	790.0	38.1	47.8	38.1	47.8	26.9	44.5	3086	35.1
1981	3283.9	790.0	68.0	51.1	68.0	51.1	47.5	45.0	5800	66.2
1982	1942.1	790.0	41.4	49.7	41.4	49.7	28.1	42.6	3378	38.6
1983	3941.7	790.0	65.3	51.6	65.3	51.6	57.0	44.4	5630	64.3
1984	1429.0	790.0	28.9	49.2	28.9	49.2	20.6	41.8	2236	25.5
1985	5021.9	790.0	84.1	52.6	80.0	52.2	72.6	44.8	6983	79.7
1986	2933.1	790.0	48.5	52.2	48.5	51.9	42.4	44.6	4027	46.0
1987	5694.1	790.0	94.0	55.6	94.0	55.3	82.3	47.7	8203	93.6
1988	3929.2	790.0	62.8	56.2	62.8	55.9	56.6	48.4	5361	61.0
1989	4195.4	790.0	67.4	57.0	67.4	56.7	60.6	49.2	5763	65.8
1990	4067.4	790.0	66.1	57.6	66.1	57.3	58.8	49.8	5616	64.1
1991	3664.2	775.0	57.8	57.6	57.8	57.3	54.0	50.1	4959	56.6
1992	1315.1	754.0	25.1	55.8	25.1	55.5	19.9	48.4	2200	25.0
1993	4000.9	754.0	63.1	56.2	63.1	55.9	60.6	49.1	5525	63.1
1994	4823.2	754.0	73.5	57.0	73.5	56.8	73.0	50.3	6436	73.5
1995	6216.0	754.0	100.0	59.1	100.0	58.9	94.1	52.3	8760	100.0
1996	5188.1	754.0	86.9	60.3	82.9	60.0	78.3	53.5	7277	82.8
1997	6055.4	754.0	89.2	61.6	89.2	61.2	91.7	55.2	7816	89.2
1998	6963.5	811.0	98.9	63.3	97.7	62.9	98.0	57.1	8539	97.5
1999	6095.2	811.0	89.2	64.4	86.5	63.9	85.8	58.3	7577	86.5
2000	7055.0	811.0	98.1	65.8	98.1	65.3	99.0	60.0	8616	98.1
2001	6540.4	811.0	91.3	66.8	91.3	66.3	92.1	61.3	7996	91.3
2002	7078.6	811.0	98.3	68.0	98.3	67.5	99.6	62.7	8609	98.3
2003	7028.1	811.0	91.0	68.8	91.0	68.4	98.9	64.1	7966	90.9
2004	7756.8	900.0	98.5	70.0	98.5	69.6	98.1	65.4	8639	98.3
2005	6781.7	811.0	88.2	70.6	88.2	70.2	95.4	66.4	7724	88.2
2006	7361.3	937.0	91.0	71.4	91.0	71.0	89.7	67.3	7972	91.0
2007	7140.3	937.0	87.3	72.0	87.3	71.6	87.0	68.0	7645	87.3
2008	7854.2	937.0	96.2	72.8	96.2	72.5	95.4	69.0	8448	96.2



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		335			668	
B. Refuelling without a maintenance					52	
C. Inspection, maintenance or repair combined with refuelling				1177		
D. Inspection, maintenance or repair without refuelling				385		
E. Testing of plant systems or component				13	4	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					5	31
Subtotal	0	335	0	1575	729	31
Total		335			2335	

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		24
13. Reactor Auxiliary System		14
14. Safety Systems		37
15. Reactor Cooling System	183	257
31. Turbine and auxiliaries		89
32. Feedwater and Main Steam System	151	51
33. Circulating Water System		0
41. Main Generator System		32
42. Electrical Power Supply System		72
XX. Miscellaneous Systems		6
Total	334	585

# US-454 BYRON-1

Operator: EXELON (Exelon Generation)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9733.4 GW(e).h  
 Energy Availability Factor: 94.1%  
 Load Factor: 95.2%  
 Operating Factor: 94.1%  
 Energy Unavailability Factor: 5.9%  
 Total Off-line Time: 518 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	886.8	829.9	648.2	421.7	883.7	847.6	869.9	873.4	848.7	882.2	856.1	885.1	9733.4
EAF (%)	100.0	100.0	74.0	54.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.1
UCF (%)	100.0	100.0	74.0	54.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.1
LF (%)	102.4	102.4	75.0	50.3	102.0	101.1	100.5	100.9	101.3	101.9	102.0	102.2	95.2
OF (%)	100.0	100.0	74.0	54.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.1
EUF (%)	0.0	0.0	26.0	45.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
PUF (%)	0.0	0.0	26.0	45.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 31 Dec 1975      Lifetime Generation: 192987.9 GW(e).h  
 Date of First Criticality: 02 Feb 1985      Cumulative Energy Availability Factor: 87.2%  
 Date of Grid Connection: 01 Mar 1985      Cumulative Load Factor: 83.5%  
 Date of Commercial Operation: 16 Sep 1985      Cumulative Unit Capability Factor: 87.3%  
    Cumulative Energy Unavailability Factor: 12.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	1012.9	1124.0	46.8	46.8	46.8	46.8	34.9	34.9	1191	46.4
1986	7396.0	1129.0	89.1	79.5	89.1	79.5	74.8	65.7	7760	88.6
1987	5355.7	1125.0	69.6	75.2	68.7	74.8	54.3	60.8	6005	68.6
1988	6303.7	1112.0	72.9	74.5	72.9	74.2	64.5	61.9	6393	72.8
1989	8945.5	1105.0	99.7	80.3	99.7	80.1	92.4	68.9	8737	99.7
1990	6951.7	1105.0	80.3	80.3	80.3	80.1	71.8	69.5	7059	80.6
1991	6318.1	1105.0	81.3	80.5	81.3	80.3	65.3	68.8	7148	81.6
1992	8986.4	1105.0	99.3	83.0	99.3	82.9	92.6	72.0	8723	99.3
1993	7366.9	1105.0	80.9	82.8	80.9	82.7	76.1	72.5	7104	81.1
1994	6801.6	1105.0	81.2	82.6	81.2	82.5	70.3	72.3	7136	81.5
1995	7706.5	1105.0	82.3	82.6	82.3	82.5	79.6	73.0	7228	82.5
1996	6871.1	1105.0	74.7	81.9	74.7	81.8	70.8	72.8	6588	75.0
1997	7161.7	1105.0	76.8	81.5	76.8	81.4	74.0	72.9	6737	76.9
1998	7804.6	1105.0	81.5	81.5	81.5	81.4	80.6	73.5	7145	81.6
1999	8908.5	1105.0	90.6	82.1	90.6	82.1	92.0	74.8	7944	90.7
2000	9291.9	1105.0	94.2	82.9	94.2	82.8	95.7	76.1	8284	94.3
2001	10389.9	1163.0	100.0	84.0	100.0	83.9	104.1	77.9	8760	100.0
2002	9827.8	1163.0	94.1	84.6	94.1	84.5	96.5	79.0	8256	94.2
2003	9858.8	1163.0	94.0	85.1	94.0	85.1	96.8	80.0	8248	94.2
2004	10381.3	1152.0	100.0	85.9	100.0	85.9	102.2	81.2	8784	100.0
2005	9589.7	1194.0	92.9	86.3	92.9	86.2	91.7	81.8	8135	92.9
2006	9317.0	1164.0	90.4	86.5	90.4	86.4	91.4	82.2	7914	90.3
2007	10024.2	1164.0	96.8	87.0	96.8	86.9	98.3	83.0	8482	96.8
2008	9733.4	1164.0	94.1	87.3	94.1	87.2	95.2	83.5	8266	94.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					69	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling	517			782		
D. Inspection, maintenance or repair without refuelling				177		
H. Nuclear regulatory requirement					14	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				3	5	3
Subtotal	517	0	0	962	97	3
Total	517			1062		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary System		1
15. Reactor Cooling System		7
21. Fuel Handling and Storage Facilities		21
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System		9
41. Main Generator System		0
42. Electrical Power Supply System		5
Total	0	62

## US-455 BYRON-2

Operator: EXELON (Exelon Generation)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9624.2 GW(e).h  
 Energy Availability Factor: 94.9%  
 Load Factor: 96.4%  
 Operating Factor: 94.9%  
 Energy Unavailability Factor: 5.1%  
 Total Off-line Time: 445 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	869.1	811.7	865.3	835.3	861.1	828.9	855.0	856.1	829.5	302.9	840.8	868.4	9624.2
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	40.2	100.0	100.0	94.9
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	40.3	100.0	100.0	94.9
LF (%)	102.8	102.7	102.5	102.1	101.9	101.3	101.2	101.3	101.4	35.8	102.7	102.7	96.4
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	40.2	100.0	100.0	94.9
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.8	0.0	0.0	5.1
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.8	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	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. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 31 Dec 1975      Lifetime Generation: 185564.3 GW(e).h  
 Date of First Criticality: 09 Jan 1987      Cumulative Energy Availability Factor: 91.6%  
 Date of Grid Connection: 06 Feb 1987      Cumulative Load Factor: 87.6%  
 Date of Commercial Operation: 21 Aug 1987      Cumulative Unit Capability Factor: 91.6%  
    Cumulative Energy Unavailability Factor: 8.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	1970.9	1128.0	100.0	100.0	100.0	100.0	47.5	47.5	2310	62.9
1988	6357.9	1112.0	95.9	97.1	95.9	97.1	65.1	59.8	8419	95.8
1989	6069.5	1105.0	79.5	89.9	79.5	89.9	62.7	61.0	6981	79.7
1990	6052.7	1105.0	75.0	85.5	75.0	85.5	62.5	61.5	6598	75.3
1991	8772.7	1105.0	96.9	88.1	96.9	88.1	90.6	68.0	8489	96.9
1992	7000.3	1105.0	79.8	86.6	79.8	86.6	72.1	68.8	7027	80.0
1993	7622.5	1105.0	84.3	86.2	84.3	86.2	78.7	70.3	7399	84.5
1994	9504.2	1105.0	99.4	88.0	99.4	88.0	98.2	74.1	8704	99.4
1995	8183.8	1105.0	87.9	88.0	87.9	88.0	84.5	75.3	7710	88.0
1996	7830.6	1105.0	82.0	87.3	82.0	87.3	80.7	75.9	7225	82.3
1997	9102.9	1105.0	95.2	88.1	95.2	88.1	94.0	77.6	8344	95.3
1998	8592.8	1105.0	89.5	88.2	89.5	88.2	88.8	78.6	7855	89.7
1999	9174.1	1105.0	93.3	88.6	93.3	88.6	94.8	79.9	8182	93.4
2000	10005.4	1105.0	99.3	89.4	99.3	89.4	103.1	81.6	8724	99.3
2001	9826.7	1131.0	95.3	89.8	95.3	89.8	100.1	82.9	8353	95.4
2002	9537.6	1131.0	92.3	90.0	92.3	90.0	96.3	83.8	8119	92.7
2003	10298.7	1131.0	100.0	90.6	100.0	90.6	103.9	85.1	8760	100.0
2004	9623.2	1125.0	95.0	90.9	95.0	90.9	97.2	85.8	8360	95.2
2005	9521.0	1162.0	95.1	91.1	95.1	91.1	93.5	86.2	8328	95.1
2006	10158.7	1136.0	100.0	91.6	100.0	91.6	102.1	87.0	8760	100.0
2007	8828.6	1136.0	88.3	91.4	88.3	91.4	88.7	87.1	7736	88.3
2008	9624.2	1136.0	94.9	91.6	94.9	91.6	96.4	87.6	8339	94.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				8	78	
C. Inspection, maintenance or repair combined with refuelling	444			584		
D. Inspection, maintenance or repair without refuelling				33		
H. Nuclear regulatory requirement					12	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					7	
Subtotal	444	0	0	625	97	0
Total		444			722	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		5
15. Reactor Cooling System:		10
16. Steam generation system:		19
17. Safety I&C Systems (excluding reactor I&C)		3
21. Fuel Handling and Storage Facilities		2
32. Feedwater and Main Steam System		3
35. All other I&C Systems		2
41. Main Generator System:		9
42. Electrical Power Supply System:		1
Total	0	54

# US-483 CALLAWAY-1

Operator: AMERGENE (AMERGEN ENERGY GENERATING CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1190.0 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 2008

Net Energy Production: 9378.2 GW(e).h  
 Energy Availability Factor: 89.2%  
 Load Factor: 89.7%  
 Operating Factor: 89.2%  
 Energy Unavailability Factor: 10.8%  
 Total Off-line Time: 950 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	919.8	861.6	897.3	879.8	904.5	861.5	879.0	889.5	869.4	281.8	579.4	554.7	9378.2
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	32.1	73.0	66.5	89.2
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	32.1	73.0	66.5	89.2
LF (%)	103.9	104.0	101.5	102.7	102.2	100.6	99.3	100.5	101.5	31.8	67.5	62.7	89.7
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	32.1	73.0	66.4	89.2
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.9	27.0	33.5	10.8
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.9	23.0	0.0	7.6
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	33.5	3.2
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 16 Apr 1976      Lifetime Generation: 207500.3 GW(e).h  
 Date of First Criticality: 02 Oct 1984      Cumulative Energy Availability Factor: 88.1%  
 Date of Grid Connection: 24 Oct 1984      Cumulative Load Factor: 86.9%  
 Date of Commercial Operation: 19 Dec 1984      Cumulative Unit Capability Factor: 88.2%  
 Cumulative Energy Unavailability Factor: 11.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	323.0	1140.0	100.0	100.0	100.0	100.0	90.0	90.0	303	100.0
1985	8045.8	1120.0	90.0	90.3	90.0	90.3	82.0	82.3	7882	90.0
1986	7199.1	1120.0	81.6	86.0	81.6	86.0	73.4	77.9	7121	81.3
1987	6321.8	1120.0	70.0	80.8	70.0	80.8	64.4	73.5	6141	70.1
1988	8144.2	1120.0	92.5	83.7	92.5	83.7	82.8	75.8	7413	84.4
1989	8350.9	1118.0	84.0	83.8	84.0	83.8	85.3	77.7	7368	84.1
1990	8005.1	1125.0	81.8	83.4	81.8	83.4	81.2	78.3	7167	81.8
1991	9979.4	1125.0	99.6	85.7	99.6	85.7	101.3	81.5	8726	99.6
1992	8094.6	1125.0	82.0	85.3	82.0	85.3	81.9	81.6	7204	82.0
1993	8390.0	1120.0	85.5	85.3	85.5	85.3	85.5	82.0	7498	85.6
1994	10006.5	1115.0	99.6	86.7	99.6	86.7	102.4	84.0	8726	99.6
1995	8252.8	1125.0	84.0	86.5	84.0	86.5	83.7	84.0	7356	84.0
1996	8890.4	1125.0	89.6	86.7	89.6	86.7	90.0	84.5	7864	89.5
1997	8954.6	1125.0	100.0	87.8	100.0	87.8	90.9	85.0	8760	100.0
1998	8516.8	1125.0	90.4	87.9	90.4	87.9	86.4	85.1	7913	90.3
1999	8596.4	1125.0	87.8	87.9	87.8	87.9	87.2	85.2	7707	88.0
2000	9991.8	1125.0	100.0	88.7	99.7	88.7	101.1	86.2	8762	99.7
2001	8384.1	1125.0	85.4	88.5	85.4	88.5	85.1	86.2	7500	85.6
2002	8386.6	1125.0	85.2	88.3	85.2	88.3	85.1	86.1	7484	85.4
2003	9699.7	1125.0	95.8	88.7	95.8	88.7	98.4	86.8	8397	95.9
2004	7842.4	1125.0	77.9	88.2	77.9	88.2	79.4	86.4	6856	78.1
2005	8021.2	1137.0	79.6	87.7	79.6	87.7	80.5	86.1	6966	79.5
2006	10098.9	1190.0	95.0	88.1	95.0	88.1	96.9	86.6	8324	95.0
2007	9372.0	1190.0	88.4	88.1	88.4	88.1	89.9	86.8	7742	88.4
2008	9378.2	1190.0	89.2	88.2	89.2	88.1	89.7	86.9	7834	89.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		277			153	
B. Refuelling without a maintenance outage					7	
C. Inspection, maintenance or repair combined with refuelling	671			695		
D. Inspection, maintenance or repair without refuelling				88	1	
E. Testing of plant systems or component				0		
H. Nuclear regulatory requirement					0	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					6	0
L. Human factor related					2	
Z. Others					1	
Subtotal	671	277	0	783	170	0
Total		948			953	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		10
14. Safety Systems	28	
15. Reactor Cooling System:		14
16. Steam generation system:		4
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System	249	28
33. Circulating Water System		14
35. All other I&C Systems		2
41. Main Generator System:		10
42. Electrical Power Supply System:		19
XX. Miscellaneous Systems		7
Total	277	139

# US-317 CALVERT CLIFFS-1

**Operator:** CCNPP (Calvert Cliffs Nuclear Power Plant Inc.)

**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 873.0 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 2008

**Net Energy Production:** 7161.1 GW(e).h  
**Energy Availability Factor:** 94.2%  
**Load Factor:** 93.4%  
**Operating Factor:** 94.2%  
**Energy Unavailability Factor:** 5.8%  
**Total Off-line Time:** 509 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	663.9	462.1	327.7	637.9	654.2	617.3	625.2	623.4	616.8	641.2	633.9	657.3	7161.1
<b>EAF (%)</b>	100.0	75.4	54.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.2
<b>UCF (%)</b>	100.0	75.4	54.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.2
<b>LF (%)</b>	102.2	76.1	50.5	101.5	100.7	98.2	96.3	96.0	98.1	98.7	100.7	101.2	93.4
<b>OF (%)</b>	100.0	75.3	54.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.2
<b>EUF (%)</b>	0.0	24.6	45.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8
<b>PUF (%)</b>	0.0	24.6	40.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4
<b>UCLF (%)</b>	0.0	0.0	5.0	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. 2008 Summary of Operation



## 5. Historical Summary

<b>Date of Construction Start:</b>	07 Jul 1969	<b>Lifetime Generation:</b>	191142.9 GW(e).h
<b>Date of First Criticality:</b>	07 Oct 1974	<b>Cumulative Energy Availability Factor:</b>	77.1%
<b>Date of Grid Connection:</b>	03 Jan 1975	<b>Cumulative Load Factor:</b>	77.8%
<b>Date of Commercial Operation:</b>	08 May 1975	<b>Cumulative Unit Capability Factor:</b>	77.4%
		<b>Cumulative Energy Unavailability Factor:</b>	22.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	3641.1	800.0	77.2	77.2	77.2	77.2	77.4	77.4	4807	81.8
1976	6303.9	800.0	89.7	84.7	89.7	84.7	89.7	84.8	8356	95.1
1977	4882.0	807.0	68.6	78.6	68.6	78.6	69.1	78.9	6313	72.1
1978	4676.1	810.0	65.9	75.2	65.9	75.2	65.9	75.3	6150	70.2
1979	4194.1	810.0	59.1	71.7	59.1	71.7	59.1	71.8	6154	70.3
1980	4542.5	810.0	77.0	72.6	72.2	71.8	63.8	70.4	6349	72.3
1981	6109.6	821.0	86.4	74.7	86.4	74.0	85.0	72.6	7544	86.1
1982	5362.1	825.0	73.9	74.6	73.9	74.0	74.2	72.8	6419	73.3
1983	5570.7	825.0	77.0	74.9	77.0	74.4	77.1	73.3	6719	76.7
1984	6221.6	825.0	86.7	76.1	84.3	75.4	85.9	74.6	7422	84.5
1985	4359.7	825.0	58.8	74.5	58.8	73.8	60.3	73.3	5186	59.2
1986	5830.7	825.0	78.2	74.8	78.2	74.2	80.7	73.9	6855	78.3
1987	5268.5	825.0	70.9	74.5	70.9	73.9	72.9	73.8	6233	71.2
1988	5164.2	825.0	71.0	74.2	71.0	73.7	71.3	73.7	6263	71.3
1989	1345.6	825.0	18.8	70.4	18.8	69.9	18.6	69.9	1727	19.7
1990	1344.4	825.0	20.1	67.2	20.1	66.7	18.6	66.6	1840	21.0
1991	5465.3	825.0	75.5	67.7	75.5	67.3	75.6	67.1	6638	75.8
1992	4113.9	825.0	55.6	67.0	55.6	66.6	56.8	66.5	4927	56.1
1993	7334.9	827.0	98.2	68.7	98.2	68.3	101.2	68.4	8599	98.2
1994	4686.4	832.0	64.6	68.5	64.6	68.1	64.2	68.2	5656	64.6
1995	7030.2	835.0	96.9	69.9	96.9	69.5	96.1	69.6	8487	96.9
1996	4846.9	835.0	65.7	69.7	65.7	69.3	66.1	69.4	5762	65.6
1997	7158.4	835.0	95.9	70.9	95.9	70.5	97.9	70.7	8400	95.9
1998	6116.8	835.0	82.0	71.3	82.0	71.0	83.6	71.2	7184	82.0
1999	6994.3	835.0	96.8	72.4	94.0	72.0	95.6	72.2	8231	94.0
2000	6449.6	827.0	86.2	72.9	86.2	72.5	88.7	72.9	7580	86.3
2001	7454.8	825.0	99.6	73.9	99.6	73.5	103.2	74.0	8727	99.6
2002	4645.2	825.0	62.8	73.5	62.8	73.2	64.3	73.7	5506	62.9
2003	7532.5	825.0	100.0	74.4	100.0	74.1	104.2	74.7	8760	100.0
2004	6974.0	870.0	91.5	75.0	91.5	74.7	93.3	75.4	8034	91.5
2005	7626.3	845.0	99.6	75.9	99.6	75.5	103.0	76.3	8726	99.6
2006	6449.8	873.0	84.3	76.1	84.3	75.8	84.3	76.6	7386	84.3
2007	7545.4	873.0	99.3	76.9	99.3	76.6	98.7	77.3	8701	99.3
2008	7161.1	873.0	94.2	77.4	94.2	77.1	93.4	77.8	8275	94.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		36			293	
B. Refuelling without a maintenance outage					8	
C. Inspection, maintenance or repair combined with refuelling	471			967		
D. Inspection, maintenance or repair without refuelling				492		
E. Testing of plant systems or component				46		
H. Nuclear regulatory requirement					6	20
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					64	13
Subtotal	471	36	0	1505	371	33
Total		507			1909	

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		11
12. Reactor I&C Systems		9
13. Reactor Auxiliary System		23
14. Safety Systems		37
15. Reactor Cooling System		66
16. Steam generation system		0
17. Safety I&C Systems (excluding reactor I&C)	36	1
31. Turbine and auxiliaries		65
32. Feedwater and Main Steam System		48
33. Circulating Water System		1
35. All other I&C Systems		2
41. Main Generator System		2
42. Electrical Power Supply System		14
XX. Miscellaneous Systems		0
Total	36	279

## US-318 CALVERT CLIFFS-2

**Operator:** CCNPP (Calvert Cliffs Nuclear Power Plant Inc.)

**Contractor:** CE (COMBUSTION ENGINEERING CO.)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 862.0 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 2008

**Net Energy Production:** 7514.7 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 99.2%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	654.0	606.9	646.6	624.5	638.0	612.3	616.9	611.9	596.3	631.9	627.3	648.3	7514.7
<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>	102.0	101.2	101.0	100.6	99.5	98.7	96.2	95.4	96.1	98.5	100.9	101.1	99.2
<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	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	07 Jul 1969	<b>Lifetime Generation:</b>	188724.2 GW(e).h
<b>Date of First Criticality:</b>	30 Nov 1976	<b>Cumulative Energy Availability Factor:</b>	81.0%
<b>Date of Grid Connection:</b>	07 Dec 1976	<b>Cumulative Load Factor:</b>	80.7%
<b>Date of Commercial Operation:</b>	01 Apr 1977	<b>Cumulative Unit Capability Factor:</b>	81.0%
		<b>Cumulative Energy Unavailability Factor:</b>	19.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	4541.5	810.0	100.0	100.0	100.0	100.0	85.0	85.0	5676	86.0
1978	5226.6	810.0	72.8	84.5	72.8	84.5	73.7	78.5	7129	81.4
1979	5489.0	812.0	76.6	81.6	76.6	81.6	77.2	78.0	6792	77.5
1980	6412.3	825.0	98.9	86.3	96.2	85.6	88.5	80.9	8425	95.9
1981	5416.0	825.0	80.1	85.0	80.1	84.4	74.9	79.6	7005	80.0
1982	5005.2	825.0	74.2	83.1	74.2	82.6	69.3	77.8	6496	74.2
1983	6113.1	825.0	86.4	83.6	86.4	83.2	84.6	78.8	7567	86.4
1984	5338.4	825.0	73.7	82.3	73.7	82.0	73.7	78.1	6502	74.0
1985	5608.0	825.0	77.4	81.7	77.4	81.4	77.6	78.1	6789	77.5
1986	7006.7	825.0	96.0	83.2	96.0	82.9	97.0	80.0	8405	95.9
1987	4832.0	825.0	66.3	81.6	66.3	81.4	66.9	78.8	5859	66.9
1988	6602.7	825.0	88.8	82.2	88.8	82.0	91.1	79.8	7813	88.9
1989	1448.5	825.0	18.3	77.2	18.3	77.0	20.0	75.1	1731	19.8
1990	0.0	825.0	0.0	71.6	0.0	71.4	0.0	69.7	0	0.0
1991	3635.6	825.0	51.3	70.2	51.3	70.0	50.3	68.3	4515	51.5
1992	6590.3	825.0	89.3	71.4	89.3	71.3	90.9	69.8	7855	89.4
1993	4975.2	827.0	67.4	71.2	67.4	71.0	68.6	69.7	5939	67.8
1994	6576.5	835.0	90.6	72.3	90.6	72.1	89.8	70.9	7925	90.5
1995	5911.1	840.0	81.4	72.8	81.4	72.6	80.3	71.4	7121	81.3
1996	7247.7	840.0	97.5	74.1	97.5	73.9	98.2	72.8	8561	97.5
1997	5979.9	840.0	81.1	74.4	81.1	74.3	81.3	73.2	7100	81.1
1998	7225.5	840.0	95.8	75.4	95.8	75.3	98.2	74.3	8393	95.8
1999	6332.7	840.0	84.5	75.8	84.5	75.7	86.1	74.9	7400	84.5
2000	7391.0	835.0	98.1	76.8	98.1	76.6	100.7	76.0	8614	98.1
2001	6201.5	835.0	83.3	77.0	83.3	76.9	84.8	76.3	7297	83.3
2002	7480.6	835.0	100.0	77.9	100.0	77.8	102.3	77.3	8760	100.0
2003	6156.9	835.0	81.4	78.0	81.4	77.9	84.2	77.6	7124	81.3
2004	7552.2	858.0	99.4	78.8	99.4	78.7	101.3	78.5	8729	99.4
2005	7114.3	858.0	94.2	79.4	94.2	79.3	94.6	79.1	8249	94.2
2006	7406.3	862.0	98.4	80.1	98.4	80.0	98.1	79.7	8621	98.4
2007	6807.8	862.0	90.2	80.4	90.2	80.3	90.2	80.1	7902	90.2
2008	7514.7	862.0	100.0	81.0	100.0	81.0	99.2	80.7	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					228	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling				1290		
D. Inspection, maintenance or repair without refuelling				85		
E. Testing of plant systems or component				10	0	
H. Nuclear regulatory requirement					1	7
J. Grid limitation, failure or grid unavailability					0	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					11	
L. Human factor related					3	
Subtotal	0	0	0	1385	257	7
Total	0			1649		

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		14
13. Reactor Auxiliary Systems		27
14. Safety Systems		1
15. Reactor Cooling Systems		68
16. Steam generation system		3
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		44
35. All other I&C Systems		3
41. Main Generator Systems		16
42. Electrical Power Supply Systems		18
Total	0	223

**US-413 CATAWBA-1****Operator:** DUKE (DUKE POWER CO.)**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)**1. Station Details**

**Type:** PWR

**Net Reference Unit Power**

**at the beginning of 2008:** 1129.0 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 2008**

**Net Energy Production:** 8773.3 GW(e).h

**Energy Availability Factor:** 86.6%

**Load Factor:** 88.5%

**Operating Factor:** 86.6%

**Energy Unavailability Factor:** 13.4%

**Total Off-line Time:** 1174 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	869.3	812.4	864.4	836.9	50.0	230.0	854.1	855.0	828.8	866.4	843.8	862.2	8773.3
<b>EAf (%)</b>	100.0	100.0	100.0	100.0	7.1	33.0	100.0	100.0	100.0	100.0	100.0	100.0	86.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	7.1	33.0	100.0	100.0	100.0	100.0	100.0	100.0	86.6
<b>LF (%)</b>	103.5	103.4	103.0	103.0	5.9	28.3	101.7	101.8	102.0	103.1	103.7	102.7	88.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	7.1	32.9	100.0	100.0	100.0	100.0	100.0	100.0	86.6
<b>EUf (%)</b>	0.0	0.0	0.0	0.0	92.9	67.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4
<b>PUf (%)</b>	0.0	0.0	0.0	0.0	92.9	67.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4
<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. 2008 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 07 Aug 1975      **Lifetime Generation:** 193129.8 GW(e).h

**Date of First Criticality:** 07 Jan 1985      **Cumulative Energy Availability Factor:** 83.9%

**Date of Grid Connection:** 22 Jan 1985      **Cumulative Load Factor:** 82.9%

**Date of Commercial Operation:** 29 Jun 1985      **Cumulative Unit Capability Factor:** 83.9%

**Cumulative Energy Unavailability Factor:** 16.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	3440.5	1138.0	78.8	78.8	78.8	78.8	67.3	67.3	3513	78.7
1986	5199.1	1145.0	58.9	65.6	58.9	65.6	51.8	57.1	5151	58.8
1987	6406.0	1145.0	68.0	66.6	68.0	66.6	63.9	59.8	5924	67.6
1988	7640.0	1129.0	79.8	70.3	79.8	70.3	77.0	64.6	7003	79.7
1989	7775.4	1129.0	84.7	73.4	84.7	73.4	78.6	67.7	7278	83.1
1990	6900.5	1129.0	71.7	73.1	71.7	73.1	69.8	68.1	6277	71.7
1991	6681.1	1129.0	71.1	72.8	71.1	72.8	67.6	68.0	6227	71.1
1992	7050.9	1129.0	72.1	72.7	72.1	72.7	71.1	68.4	6338	72.2
1993	7597.1	1129.0	79.0	73.5	79.0	73.5	76.8	69.4	6916	78.9
1994	9778.8	1129.0	99.6	76.2	99.6	76.2	98.9	72.5	8722	99.6
1995	8721.6	1129.0	88.1	77.3	88.1	77.3	88.2	74.0	7712	88.0
1996	6341.1	1129.0	66.2	76.4	66.2	76.4	63.9	73.1	5806	66.1
1997	9192.5	1129.0	90.7	77.5	90.7	77.5	92.9	74.7	7966	90.9
1998	8903.7	1129.0	90.5	78.5	90.5	78.5	90.0	75.8	7923	90.4
1999	9073.7	1129.0	91.2	79.3	91.2	79.3	91.7	76.9	7987	91.2
2000	8923.0	1129.0	89.3	80.0	89.3	80.0	90.0	77.8	7844	89.3
2001	9977.0	1129.0	99.6	81.2	99.6	81.2	100.9	79.2	8722	99.6
2002	9481.6	1129.0	94.2	81.9	94.2	81.9	95.9	80.1	8250	94.2
2003	8198.5	1129.0	81.7	81.9	81.7	81.9	82.9	80.3	7157	81.7
2004	9711.1	1129.0	98.0	82.7	98.0	82.7	97.9	81.2	8608	98.0
2005	9177.3	1129.0	91.7	83.1	91.7	83.1	92.8	81.7	8027	91.6
2006	8115.0	1129.0	80.7	83.0	80.7	83.0	82.1	81.7	7066	80.7
2007	10070.9	1129.0	99.6	83.8	99.6	83.8	101.8	82.6	8728	99.6
2008	8773.3	1129.0	86.6	83.9	86.6	83.9	88.5	82.9	7610	86.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				2	327	
B. Refuelling without a maintenance					6	
C. Inspection, maintenance or repair combined with refuelling	1171			915		
D. Inspection, maintenance or repair without refuelling				59		
E. Testing of plant systems or component:	2			2	4	
H. Nuclear regulatory requirement					5	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				2	6	
Subtotal	1173	0	0	980	348	0
Total	1173			1328		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		6
12. Reactor I&C Systems		31
13. Reactor Auxiliary System:		11
14. Safety Systems		24
15. Reactor Cooling System:		106
16. Steam generation system:		1
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		65
33. Circulating Water System		13
41. Main Generator System:		11
42. Electrical Power Supply System:		32
XX. Miscellaneous Systems		9
Total	0	324

# US-414 CATAWBA-2

Operator: DUKE (DUKE POWER CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1129.0 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 2008

Net Energy Production: 10203.2 GW(e).h  
 Energy Availability Factor: 100.0%  
 Load Factor: 102.9%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.0%  
 Total Off-line Time: 0 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	873.7	815.1	868.7	838.8	859.5	824.7	856.7	855.7	832.3	865.9	841.9	870.2	10203.2
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 (%)	104.0	103.7	103.6	103.2	102.3	101.4	102.0	101.9	102.4	103.1	103.4	103.6	102.9
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 07 Aug 1975      Lifetime Generation: 186005.9 GW(e).h  
 Date of First Criticality: 08 May 1986      Cumulative Energy Availability Factor: 85.0%  
 Date of Grid Connection: 18 May 1986      Cumulative Load Factor: 83.9%  
 Date of Commercial Operation: 19 Aug 1986      Cumulative Unit Capability Factor: 85.0%  
 Cumulative Energy Unavailability Factor: 15.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	1324.2	1135.0	41.8	41.8	41.8	41.8	35.7	35.7	1325	40.9
1987	7169.5	1145.0	80.2	69.8	80.2	69.8	71.5	61.8	7014	80.1
1988	5435.0	1129.0	71.8	70.6	71.8	70.6	54.8	58.9	5571	63.4
1989	6527.1	1129.0	72.0	71.0	72.0	71.0	66.0	61.0	6302	71.9
1990	6503.0	1129.0	69.0	70.6	69.0	70.6	65.8	62.1	5984	68.3
1991	7274.9	1129.0	75.6	71.5	75.6	71.5	73.6	64.2	6621	75.6
1992	9273.5	1129.0	94.3	75.1	94.3	75.1	93.5	68.8	8281	94.3
1993	8177.4	1129.0	82.6	76.1	82.6	76.1	82.7	70.7	7233	82.6
1994	7691.7	1129.0	79.7	76.5	79.7	76.5	77.8	71.5	6978	79.7
1995	7960.2	1129.0	80.8	77.0	80.8	77.0	80.5	72.5	7074	80.8
1996	9233.6	1129.0	92.3	78.5	92.3	78.5	93.1	74.5	8107	92.3
1997	8593.4	1129.0	87.1	79.2	87.1	79.2	86.9	75.6	7623	87.0
1998	8672.3	1129.0	86.5	79.8	86.5	79.8	87.7	76.5	7580	86.5
1999	8855.4	1129.0	88.2	80.4	88.2	80.4	89.5	77.5	7727	88.2
2000	8981.4	1129.0	90.3	81.1	90.3	81.1	90.6	78.4	7928	90.3
2001	8574.1	1129.0	85.7	81.4	85.7	81.4	86.7	78.9	7507	85.7
2002	10172.3	1129.0	100.0	82.6	100.0	82.6	102.9	80.4	8760	100.0
2003	9318.2	1129.0	92.7	83.1	92.7	83.1	94.2	81.2	8117	92.7
2004	8835.7	1129.0	87.4	83.4	87.4	83.4	89.1	81.6	7672	87.3
2005	10099.1	1129.0	99.7	84.2	99.7	84.2	102.1	82.7	8737	99.7
2006	8779.2	1129.0	87.9	84.4	87.9	84.4	88.8	83.0	7696	87.9
2007	8351.6	1129.0	82.9	84.3	82.9	84.3	84.4	83.1	7262	82.9
2008	10203.2	1129.0	100.0	85.0	100.0	85.0	102.9	83.9	8784	100.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				15	419	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling				756		
D. Inspection, maintenance or repair without refuelling				61	0	
E. Testing of plant systems or component:				3	2	
H. Nuclear regulatory requirement					4	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	11	
Subtotal	0	0	0	835	438	0
Total	0			1273		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		5
13. Reactor Auxiliary System:		26
14. Safety Systems		8
15. Reactor Cooling System:		50
16. Steam generation system:		5
17. Safety I&C Systems (excluding reactor I&C)		15
31. Turbine and auxiliaries		66
32. Feedwater and Main Steam System		90
41. Main Generator System:		125
42. Electrical Power Supply System:		38
XX. Miscellaneous Systems		0
Total	0	428

**US-461 CLINTON-1****Operator:** AMERGENE (AMERGEN ENERGY GENERATING CO.)**Contractor:** GE (GENERAL ELECTRIC CO.)**1. Station Details**

**Type:** BWR

**Net Reference Unit Power**

**at the beginning of 2008:** 1043.0 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 2008**

**Net Energy Production:** 8546.5 GW(e).h

**Energy Availability Factor:** 92.9%

**Load Factor:** 93.3%

**Operating Factor:** 92.9%

**Energy Unavailability Factor:** 7.1%

**Total Off-line Time:** 624 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	250.6	545.1	799.2	775.0	798.4	770.4	794.6	794.0	767.5	796.6	775.8	679.3	8546.5
<b>EAF (%)</b>	35.5	79.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.9
<b>UCF (%)</b>	35.5	79.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.9
<b>LF (%)</b>	32.3	75.1	103.1	103.2	102.9	102.6	102.4	102.3	102.2	102.7	103.2	87.5	93.3
<b>OF (%)</b>	35.5	79.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.9
<b>EUF (%)</b>	64.5	20.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1
<b>PUF (%)</b>	64.5	15.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7
<b>UCLF (%)</b>	0.0	4.7	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. 2008 Summary of Operation****5. Historical Summary**

**Date of Construction Start:** 24 Feb 1976      **Lifetime Generation:** 128190.8 GW(e).h

**Date of First Criticality:** 27 Feb 1987      **Cumulative Energy Availability Factor:** 74.6%

**Date of Grid Connection:** 24 Apr 1987      **Cumulative Load Factor:** 71.3%

**Date of Commercial Operation:** 24 Nov 1987      **Cumulative Unit Capability Factor:** 74.7%

**Cumulative Energy Unavailability Factor:** 25.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	684.1	932.0	100.0	100.0	100.0	100.0	50.1	50.1	898	61.3
1988	5860.7	930.0	82.5	85.0	82.5	85.0	71.7	68.6	7244	82.5
1989	2861.9	931.0	45.1	66.6	45.1	66.6	35.1	53.2	3947	45.1
1990	3596.6	930.0	52.6	62.2	52.6	62.2	44.1	50.3	4604	52.6
1991	6048.0	930.0	79.1	66.2	79.1	66.2	74.2	56.1	6927	79.1
1992	4935.3	930.0	66.3	66.3	66.3	66.3	60.4	56.9	5824	66.3
1993	5879.2	930.0	77.1	68.0	77.1	68.0	72.2	59.4	6750	77.1
1994	7410.3	930.0	93.8	71.6	93.8	71.6	91.0	63.8	8217	93.8
1995	6109.2	930.0	81.6	72.8	81.6	72.8	75.0	65.1	7140	81.5
1996	5312.9	930.0	66.5	72.1	66.5	72.1	65.0	65.1	5833	66.4
1997	0.0	930.0	0.0	65.1	0.0	65.0	0.0	58.7	0	0.0
1998	0.0	930.0	0.0	59.2	0.0	59.2	0.0	53.5	0	0.0
1999	4704.2	930.0	60.2	59.3	60.2	59.3	57.7	53.8	5270	60.2
2000	6888.8	930.0	85.9	61.3	85.9	61.3	84.3	56.1	7542	85.9
2001	7877.2	930.0	97.8	63.9	97.8	63.9	96.7	59.0	8565	97.8
2002	7657.5	1022.0	89.8	65.7	89.8	65.7	88.8	61.1	7805	89.1
2003	8700.8	1022.0	98.6	67.9	98.6	67.9	97.2	63.5	8634	98.6
2004	8000.4	1022.0	91.5	69.4	90.0	69.3	89.1	65.1	7911	90.1
2005	8688.7	1026.0	97.0	71.0	97.0	71.0	96.7	67.0	8497	97.0
2006	8233.3	1052.0	91.1	72.2	91.1	72.1	89.3	68.3	7974	91.0
2007	9250.4	1043.0	99.5	73.7	99.5	73.6	101.2	70.1	8714	99.5
2008	8546.5	1043.0	92.9	74.7	92.9	74.6	93.3	71.3	8160	92.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		32			341	
B. Refuelling without a maintenance					18	
C. Inspection, maintenance or repair combined with refuelling	590			1654		
D. Inspection, maintenance or repair without refuelling				190		
E. Testing of plant systems or component:				2		
H. Nuclear regulatory requirement					9	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					56	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						6
Subtotal	590	32	0	1846	424	6
Total		622			2276	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	32	8
14. Safety Systems		9
15. Reactor Cooling System:		95
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		42
32. Feedwater and Main Steam System		26
41. Main Generator System:		6
42. Electrical Power Supply System:		23
Total	32	210

# US-397 COLUMBIA

Operator: ENERGYNW (Energy Northwest)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1131.0 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 2008

Net Energy Production: 9269.6 GW(e).h  
 Energy Availability Factor: 97.8%  
 Load Factor: 93.3%  
 Operating Factor: 97.8%  
 Energy Unavailability Factor: 2.2%  
 Total Off-line Time: 192 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	822.2	781.5	805.6	802.8	751.9	712.7	802.2	718.8	789.1	821.6	632.6	828.7	9269.6
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.8	100.0	100.0	82.1	100.0	97.8
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.8	100.0	100.0	82.1	100.0	97.8
LF (%)	97.7	99.3	95.9	98.6	89.4	87.5	95.3	85.4	96.9	97.6	77.6	98.5	93.3
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.7	100.0	100.0	82.0	100.0	97.8
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	0.0	0.0	17.9	0.0	2.2
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.9	0.0	1.5
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 19 Feb 1972      Lifetime Generation: 168061.8 GW(e).h  
 Date of First Criticality: 19 Jan 1984      Cumulative Energy Availability Factor: 77.9%  
 Date of Grid Connection: 27 May 1984      Cumulative Load Factor: 71.7%  
 Date of Commercial Operation: 13 Dec 1984      Cumulative Unit Capability Factor: 78.6%  
    Cumulative Energy Unavailability Factor: 22.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	410.4	1104.0	90.5	90.5	90.5	90.5	84.6	84.6	399	90.7
1985	5176.4	1100.0	77.1	77.7	77.1	77.7	53.7	55.2	6624	75.6
1986	5183.2	1095.0	74.1	76.0	74.1	76.0	54.0	54.6	6133	70.0
1987	5398.0	1095.0	67.9	73.3	67.9	73.3	56.3	55.2	5979	68.3
1988	6000.4	1095.0	68.2	72.1	68.2	72.1	62.4	56.9	6020	68.5
1989	6127.9	1095.0	76.1	72.9	76.1	72.9	63.9	58.3	6680	76.3
1990	5791.3	1095.0	65.3	71.6	65.3	71.6	60.4	58.7	5752	65.7
1991	4272.5	1090.0	47.1	68.2	47.1	68.2	44.7	56.7	4194	47.9
1992	5705.4	1085.0	62.0	67.4	62.0	67.4	59.9	57.1	5505	62.7
1993	7142.0	1107.0	77.2	68.5	77.2	68.5	73.6	58.9	6757	77.1
1994	6753.8	1086.0	73.7	69.0	73.7	69.0	71.0	60.1	6500	74.2
1995	6948.0	1091.0	76.0	69.6	76.0	69.6	72.7	61.3	6680	76.3
1996	5562.6	1106.0	79.7	70.5	68.3	69.5	57.2	60.9	5999	68.3
1997	6129.9	1107.0	77.4	71.0	71.3	69.7	63.2	61.1	6248	71.3
1998	6922.8	1107.0	72.8	71.1	72.8	69.9	71.4	61.8	6373	72.8
1999	6099.7	1107.0	68.5	71.0	68.5	69.8	62.9	61.9	6018	68.7
2000	8605.2	1107.0	95.4	72.5	95.4	71.4	88.5	63.6	8385	95.5
2001	8257.7	1107.0	86.1	73.3	86.1	72.3	85.2	64.9	7553	86.2
2002	8981.3	1107.0	97.4	74.6	97.4	73.7	92.6	66.4	8528	97.4
2003	7614.9	1107.0	80.4	74.9	80.4	74.0	78.5	67.0	7039	80.4
2004	8981.6	1107.0	93.6	75.9	93.6	75.0	92.4	68.3	8222	93.6
2005	8242.3	1108.0	86.1	76.4	86.1	75.5	84.9	69.1	7537	86.0
2006	9328.3	1131.0	97.8	77.4	97.8	76.6	94.2	70.3	8568	97.8
2007	8108.6	1131.0	85.4	77.7	85.4	77.0	81.8	70.8	7481	85.4
2008	9269.6	1131.0	97.8	78.6	97.8	77.9	93.3	71.7	8592	97.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		61			282	
B. Refuelling without a maintenance					15	
C. Inspection, maintenance or repair combined with refuelling				1088		
D. Inspection, maintenance or repair without refuelling	129			119		
E. Testing of plant systems or component:				26	0	
H. Nuclear regulatory requirement					41	
J. Grid limitation, failure or grid unavailability						60
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				74	136	
L. Human factor related					5	
Subtotal	129	61	0	1307	479	60
Total		190			1846	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		1
13. Reactor Auxiliary System:		2
14. Safety Systems		18
15. Reactor Cooling System:		32
17. Safety I&C Systems (excluding reactor I&C)	61	27
21. Fuel Handling and Storage Facilities		15
31. Turbine and auxiliaries:		90
32. Feedwater and Main Steam System		34
35. All other I&C Systems:		6
41. Main Generator System:		1
42. Electrical Power Supply System:		52
Total	61	278

# US-445 COMANCHE PEAK-1

Operator: TXU (TXU Electric Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1150.0 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 2008

Net Energy Production: 9658.7 GW(e).h  
 Energy Availability Factor: 94.1%  
 Load Factor: 95.6%  
 Operating Factor: 94.1%  
 Energy Unavailability Factor: 5.9%  
 Total Off-line Time: 522 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	874.7	733.3	872.4	843.4	869.2	836.7	860.0	859.6	719.1	391.5	884.2	914.5	9658.7
EAF (%)	100.0	92.0	100.0	100.0	100.0	100.0	100.0	100.0	88.3	48.7	100.0	100.0	94.1
UCF (%)	100.0	92.0	100.0	100.0	100.0	100.0	100.0	100.0	88.3	48.7	100.0	100.0	94.1
LF (%)	102.2	91.6	102.1	101.9	101.6	101.1	100.5	100.5	86.8	45.8	106.6	106.9	95.6
OF (%)	100.0	92.0	100.0	100.0	100.0	100.0	100.0	100.0	88.3	48.7	100.0	100.0	94.1
EUF (%)	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	11.7	51.3	0.0	0.0	5.9
PUF (%)	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	11.7	51.3	0.0	0.0	5.9
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 19 Dec 1974      Lifetime Generation: 156562.3 GW(e).h  
 Date of First Criticality: 03 Apr 1990      Cumulative Energy Availability Factor: 88.4%  
 Date of Grid Connection: 24 Apr 1990      Cumulative Load Factor: 84.2%  
 Date of Commercial Operation: 13 Aug 1990      Cumulative Unit Capability Factor: 88.4%  
 Cumulative Energy Unavailability Factor: 11.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1990	2513.5	1140.0	80.6	80.6	80.6	80.6	60.2	60.2	2865	78.0
1991	5360.5	1150.0	60.5	66.4	60.5	66.4	53.2	55.3	5341	61.0
1992	6937.5	1150.0	79.1	71.7	79.1	71.7	68.7	60.8	6947	79.1
1993	7150.4	1150.0	79.1	73.9	79.1	73.9	71.0	63.8	6932	79.1
1994	9367.6	1150.0	98.8	79.5	98.8	79.5	93.0	70.4	8653	98.8
1995	7803.7	1150.0	85.0	80.5	85.0	80.5	77.5	71.7	7444	85.0
1996	7756.2	1150.0	83.0	80.9	82.7	80.9	76.8	72.5	7265	82.7
1997	9478.9	1150.0	98.8	83.3	98.8	83.3	94.1	75.4	8656	98.8
1998	8506.0	1150.0	89.6	84.1	89.6	84.0	84.4	76.5	7848	89.6
1999	8601.5	1150.0	90.4	84.7	90.4	84.7	85.4	77.4	7922	90.4
2000	9619.8	1150.0	100.0	86.2	100.0	86.2	95.2	79.1	8784	100.0
2001	8444.3	1150.0	88.9	86.4	88.9	86.4	83.8	79.5	7781	88.8
2002	7785.3	1150.0	83.0	86.2	83.0	86.1	77.3	79.4	7213	82.3
2003	9626.0	1150.0	98.9	87.1	98.9	87.1	95.6	80.6	8653	98.8
2004	9018.1	1150.0	89.8	87.3	89.8	87.3	89.3	81.2	7877	89.7
2005	9217.8	1084.0	91.4	87.5	91.4	87.5	97.1	82.2	8004	91.4
2006	10298.0	1150.0	100.0	88.3	100.0	88.3	102.2	83.4	8760	100.0
2007	8596.7	1150.0	84.9	88.1	84.9	88.1	85.3	83.5	7437	84.9
2008	9658.7	1150.0	94.1	88.4	94.1	88.4	95.6	84.2	8262	94.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1990 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					153	
B. Refuelling without a maintenance					17	
C. Inspection, maintenance or repair combined with refuelling	465			709		
D. Inspection, maintenance or repair without refuelling	55			115		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					2	1
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					4	
Subtotal	520	0	0	824	176	1
Total	520			1001		

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

System	2008 Hours Lost	1990 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		19
13. Reactor Auxiliary System:		0
15. Reactor Cooling System:		5
16. Steam generation system:		9
31. Turbine and auxiliaries:		38
32. Feedwater and Main Steam System		15
35. All other I&C Systems:		9
41. Main Generator System:		19
42. Electrical Power Supply System:		21
Total	0	135

## US-446 COMANCHE PEAK-2

Operator: TXU (TXU Electric Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1150.0 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 2008

Net Energy Production: 9575.9 GW(e).h  
 Energy Availability Factor: 93.8%  
 Load Factor: 94.8%  
 Operating Factor: 93.8%  
 Energy Unavailability Factor: 6.2%  
 Total Off-line Time: 543 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	875.9	820.5	747.2	279.8	869.6	837.6	862.3	861.3	835.9	869.5	841.8	874.5	9575.9
EAF (%)	100.0	100.0	87.3	37.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.8
UCF (%)	100.0	100.0	87.3	37.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.8
LF (%)	102.4	102.5	87.5	33.8	101.6	101.2	100.8	100.7	101.0	101.6	101.5	102.2	94.8
OF (%)	100.0	100.0	87.2	37.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.8
EUF (%)	0.0	0.0	12.7	62.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
PUF (%)	0.0	0.0	8.1	62.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8
UCLF (%)	0.0	0.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 19 Dec 1974      Lifetime Generation: 136445.7 GW(e).h  
 Date of First Criticality: 24 Mar 1993      Cumulative Energy Availability Factor: 90.6%  
 Date of Grid Connection: 09 Apr 1993      Cumulative Load Factor: 87.5%  
 Date of Commercial Operation: 03 Aug 1993      Cumulative Unit Capability Factor: 90.6%  
    Cumulative Energy Unavailability Factor: 9.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1993	3441.8	1150.0	89.7	89.7	89.7	89.7	82.8	82.8	3245	89.7
1994	5263.2	1150.0	65.1	72.3	65.1	72.3	52.2	61.2	5697	65.0
1995	9166.6	1150.0	95.7	82.0	95.7	82.0	91.0	73.5	8382	95.7
1996	7370.4	1150.0	79.4	81.2	78.7	81.0	73.0	73.4	6911	78.7
1997	8062.1	1150.0	86.2	82.4	86.2	82.2	80.0	74.9	7554	86.2
1998	9345.3	1150.0	99.8	85.6	99.8	85.4	92.8	78.2	8741	99.8
1999	8756.0	1150.0	90.2	86.3	90.2	86.2	86.9	79.5	7901	90.2
2000	8868.0	1150.0	90.2	86.8	90.2	86.7	87.8	80.7	7927	90.2
2001	9877.9	1150.0	99.7	88.4	99.7	88.3	98.1	82.7	8731	99.7
2002	8793.8	1150.0	90.1	88.5	90.1	88.5	87.3	83.2	7888	90.0
2003	8123.4	1150.0	83.8	88.1	83.8	88.0	80.6	83.0	7307	83.4
2004	10038.9	1150.0	100.0	89.1	100.0	89.1	99.4	84.4	8784	100.0
2005	9225.4	1124.0	91.1	89.3	91.1	89.2	93.7	85.1	7979	91.1
2006	9598.2	1150.0	94.3	89.7	94.3	89.6	95.3	85.9	8260	94.3
2007	10249.0	1150.0	100.0	90.4	100.0	90.3	101.7	87.0	8760	100.0
2008	9575.9	1150.0	93.8	90.6	93.8	90.6	94.8	87.5	8241	93.8



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1993 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		34			184	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	508			491		
D. Inspection, maintenance or repair without refuelling				79		
E. Testing of plant systems or component				65		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				13	3	4
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					21	
Z. Others					0	
Subtotal	508	34	0	648	208	4
Total		542			860	

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

System	2008 Hours Lost	1993 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		1
13. Reactor Auxiliary Systems		2
14. Safety Systems		43
15. Reactor Cooling Systems		57
16. Steam generation system		2
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries	34	16
32. Feedwater and Main Steam System		46
41. Main Generator Systems		5
42. Electrical Power Supply System		4
Total	34	176

## US-298 COOPER

**Operator:** NPPD (NEBRASKA PUBLIC POWER DISTRICT)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 758.0 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 2008

**Net Energy Production:** 5964.1 GW(e).h  
**Energy Availability Factor:** 89.1%  
**Load Factor:** 88.5%  
**Operating Factor:** 89.1%  
**Energy Unavailability Factor:** 10.9%  
**Total Off-line Time:** 959 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	581.6	536.6	520.4	171.9	218.0	552.1	565.3	504.2	565.8	590.1	569.3	588.9	5964.1
<b>EAF (%)</b>	100.0	100.0	100.0	36.8	42.2	100.0	100.0	90.2	100.0	100.0	100.0	100.0	89.1
<b>UCF (%)</b>	100.0	100.0	100.0	36.8	42.3	100.0	100.0	90.2	100.0	100.0	100.0	100.0	89.1
<b>LF (%)</b>	103.1	101.7	92.4	31.0	38.1	99.6	98.7	88.0	102.1	103.0	102.5	102.8	88.5
<b>OF (%)</b>	100.0	100.0	100.0	36.7	42.2	100.0	100.0	90.2	100.0	100.0	100.0	100.0	89.1
<b>EUF (%)</b>	0.0	0.0	0.0	63.2	57.8	0.0	0.0	9.8	0.0	0.0	0.0	0.0	10.9
<b>PUF (%)</b>	0.0	0.0	0.0	63.2	57.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.1
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 04 Jun 1968  
**Date of First Criticality:** 21 Feb 1974  
**Date of Grid Connection:** 10 May 1974  
**Date of Commercial Operation:** 01 Jul 1974

**Lifetime Generation:** 163422.8 GW(e).h  
**Cumulative Energy Availability Factor:** 75.3%  
**Cumulative Load Factor:** 70.7%  
**Cumulative Unit Capability Factor:** 75.4%  
**Cumulative Energy Unavailability Factor:** 24.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	1740.5	778.0	100.0	100.0	100.0	100.0	50.7	50.7	3240	73.4
1975	3363.2	764.0	50.3	67.2	50.3	67.2	50.3	50.4	7320	83.6
1976	3642.6	764.0	54.3	62.0	54.3	62.0	54.3	51.9	6626	75.4
1977	4540.1	764.0	67.9	63.7	67.9	63.7	67.8	56.5	7546	86.1
1978	4886.8	764.0	73.0	65.8	73.0	65.8	73.0	60.1	7966	90.9
1979	4995.0	764.0	74.6	67.4	74.6	67.4	74.6	62.8	7670	87.6
1980	3787.5	764.0	71.6	68.0	70.6	67.9	56.4	61.8	6240	71.0
1981	3851.1	764.0	71.0	68.4	71.0	68.3	57.5	61.2	6239	71.2
1982	5276.1	764.0	84.4	70.3	84.4	70.2	78.8	63.3	7412	84.6
1983	3343.3	764.0	62.7	69.5	62.7	69.4	50.0	61.9	5544	63.3
1984	3470.0	764.0	67.6	69.3	67.1	69.2	51.7	60.9	5901	67.2
1985	1067.7	764.0	20.1	65.1	20.1	64.9	16.0	57.0	1884	21.5
1986	4052.1	764.0	74.7	65.8	74.7	65.7	60.5	57.3	6546	74.7
1987	5522.1	764.0	94.6	68.0	94.6	67.8	82.5	59.2	8291	94.6
1988	4200.6	764.0	66.5	67.8	66.5	67.7	62.6	59.4	5887	67.0
1989	4790.9	764.0	74.9	68.3	74.9	68.2	71.6	60.2	6594	75.3
1990	5111.4	764.0	78.5	68.9	78.5	68.8	76.4	61.2	6908	78.9
1991	4803.8	764.0	77.9	69.4	77.9	69.3	71.8	61.8	6830	78.0
1992	6227.9	764.0	96.0	70.9	96.0	70.8	92.8	63.4	8436	96.0
1993	3712.9	764.0	56.8	70.1	56.8	70.1	55.5	63.0	5041	57.5
1994	2227.3	764.0	33.4	68.4	33.4	68.3	33.3	61.6	3033	34.6
1995	4127.8	764.0	64.0	68.2	64.0	68.1	61.7	61.6	5663	64.6
1996	6338.9	764.0	97.2	69.5	97.2	69.4	94.5	63.1	8540	97.2
1997	5455.7	764.0	83.6	70.1	83.6	70.0	81.5	63.8	7336	83.7
1998	4869.9	764.0	74.4	70.2	74.4	70.2	72.8	64.2	6544	74.7
1999	6510.4	764.0	97.7	71.3	97.7	71.2	97.3	65.5	8563	97.8
2000	4735.9	764.0	73.1	71.4	73.1	71.3	70.6	65.7	6414	73.0
2001	5206.5	764.0	79.9	71.7	79.9	71.6	77.8	66.1	7009	80.0
2002	6318.2	764.0	96.8	72.6	96.8	72.5	94.4	67.1	8478	96.8
2003	4492.3	764.0	71.3	72.5	71.3	72.5	67.1	67.1	6236	71.2
2004	6171.8	764.0	94.6	73.3	94.6	73.2	92.0	67.9	8299	94.5
2005	5891.9	757.0	88.8	73.7	88.8	73.7	88.8	68.6	7774	88.7
2006	5910.5	760.0	89.3	74.2	89.3	74.2	88.8	69.2	7823	89.3
2007	6671.2	758.0	99.1	75.0	99.1	74.9	100.5	70.1	8685	99.1
2008	5964.1	770.0	89.1	75.4	89.1	75.3	88.5	70.7	7825	89.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		72		3	213	1
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling	885			1231		
D. Inspection, maintenance or repair without refuelling				136		
E. Testing of plant systems or component				0	1	
H. Nuclear regulatory requirement				4	7	5
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					229	0
P. Fire					3	
Subtotal	885	72	0	1374	462	8
Total		957			1844	

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		9
13. Reactor Auxiliary Systems		22
14. Safety Systems		7
15. Reactor Cooling Systems		13
31. Turbine and auxiliaries	72	100
32. Feedwater and Main Steam System		13
35. All other I&C Systems		6
41. Main Generator Systems		7
42. Electrical Power Supply Systems		12
XX. Miscellaneous Systems		6
Total	72	198

## US-302 CRYSTAL RIVER-3

**Operator:** PROGRESS (Progress Energy Corporation)

**Contractor:** B&W (BABCOCK & WILCOX CO.)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 838.0 MW(e)  
**Design Net Capacity:** 825.0 MW(e)  
**Design Discharge Burnup:** 36000 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 7000.1 GW(e).h  
**Energy Availability Factor:** 93.5%  
**Load Factor:** 95.1%  
**Operating Factor:** 93.4%  
**Energy Unavailability Factor:** 6.5%  
**Total Off-line Time:** 576 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	630.2	607.2	209.5	628.6	607.2	620.0	639.0	539.3	623.2	648.9	629.8	617.3	7000.1
<b>EAF (%)</b>	100.0	100.0	35.7	100.0	100.0	100.0	100.0	86.9	100.0	100.0	100.0	100.0	93.5
<b>UCF (%)</b>	100.0	100.0	35.7	100.0	100.0	100.0	100.0	86.9	100.0	100.0	100.0	100.0	93.5
<b>LF (%)</b>	101.1	104.1	33.6	104.2	97.4	102.8	102.5	86.5	103.3	104.1	104.2	99.0	95.1
<b>OF (%)</b>	100.0	100.0	35.7	100.0	100.0	100.0	100.0	86.8	100.0	100.0	100.0	100.0	93.4
<b>EUF (%)</b>	0.0	0.0	64.3	0.0	0.0	0.0	0.0	13.1	0.0	0.0	0.0	0.0	6.5
<b>PUF (%)</b>	0.0	0.0	64.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.1	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	25 Sep 1968	<b>Lifetime Generation:</b>	162158.0 GW(e).h
<b>Date of First Criticality:</b>	14 Jan 1977	<b>Cumulative Energy Availability Factor:</b>	72.9%
<b>Date of Grid Connection:</b>	30 Jan 1977	<b>Cumulative Load Factor:</b>	70.8%
<b>Date of Commercial Operation:</b>	13 Mar 1977	<b>Cumulative Unit Capability Factor:</b>	73.0%
		<b>Cumulative Energy Unavailability Factor:</b>	27.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	4037.7	818.0	67.2	67.2	67.2	67.2	67.2	67.2	5916	80.6
1978	2603.0	797.0	37.3	51.1	37.3	51.1	37.3	51.1	3627	41.4
1979	3761.8	797.0	53.9	52.1	53.9	52.1	53.9	52.1	5153	58.8
1980	3353.5	785.0	51.7	52.0	51.7	52.0	48.6	51.2	4663	53.1
1981	4083.7	782.0	62.8	54.2	62.4	54.1	59.6	52.9	5444	62.1
1982	4915.7	806.0	76.1	58.0	76.1	57.9	69.6	55.8	6651	75.9
1983	3772.3	806.0	59.1	58.2	59.1	58.1	53.4	55.5	5149	58.8
1984	6478.9	821.0	94.6	62.9	94.5	62.9	89.8	60.0	8295	94.4
1985	2863.6	821.0	48.2	61.2	48.2	61.2	39.8	57.6	4171	47.6
1986	2653.2	821.0	42.3	59.3	42.3	59.2	36.9	55.5	3659	41.8
1987	3620.8	821.0	60.2	59.4	60.2	59.3	50.3	55.0	5263	60.1
1988	5768.1	821.0	84.1	61.5	84.1	61.4	80.0	57.1	7375	84.0
1989	2930.0	821.0	48.4	60.5	48.4	60.4	40.7	55.9	4190	47.8
1990	4142.9	821.0	62.3	60.6	62.3	60.6	57.6	56.0	5421	61.9
1991	5457.2	821.0	82.2	62.1	81.5	62.0	75.9	57.3	7136	81.5
1992	5315.9	821.0	75.9	63.0	75.9	62.9	73.7	58.4	6633	75.5
1993	6080.0	821.0	84.8	64.3	84.8	64.2	84.5	60.0	7409	84.6
1994	5939.9	818.0	83.4	65.4	83.4	65.3	82.8	61.2	7292	83.2
1995	7234.9	818.0	99.7	67.2	99.7	67.1	101.0	63.4	8733	99.7
1996	2417.4	818.0	35.9	65.6	35.9	65.5	33.6	61.9	3107	35.4
1997	0.0	818.0	0.0	62.4	0.0	62.4	0.0	58.9	0	0.0
1998	6481.9	818.0	88.8	63.6	88.8	63.6	90.5	60.3	7777	88.8
1999	6373.1	818.0	87.6	64.7	87.6	64.6	88.9	61.6	7677	87.6
2000	7197.7	843.0	97.5	66.1	97.5	66.1	97.2	63.1	8555	97.4
2001	6514.2	834.0	88.9	67.1	88.9	67.0	89.2	64.2	7784	88.9
2002	7300.3	834.0	99.2	68.3	99.2	68.3	99.9	65.6	8692	99.2
2003	6579.4	834.0	90.3	69.2	90.3	69.1	90.1	66.5	7911	90.3
2004	7303.3	838.0	99.2	70.3	97.7	70.2	99.2	67.8	8584	97.7
2005	6350.9	838.0	87.6	70.9	87.6	70.8	86.5	68.4	7672	87.6
2006	6953.7	838.0	93.8	71.7	93.8	71.6	94.7	69.3	8220	93.8
2007	6672.9	838.0	90.2	72.3	90.2	72.2	90.9	70.0	7896	90.1
2008	7000.1	838.0	93.5	73.0	93.5	72.9	95.1	70.8	8208	93.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		97		0	609	
B. Refuelling without a maintenance outage					7	
C. Inspection, maintenance or repair combined with refuelling				906		
D. Inspection, maintenance or repair without refuelling	477			322		
E. Testing of plant systems or component				1		
H. Nuclear regulatory requirement				20	338	
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				4	82	1
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
Subtotal	477	97	0	1253	1036	6
Total		574			2295	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		67
14. Safety Systems		24
15. Reactor Cooling System:		210
16. Steam generation system:		6
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		149
31. Turbine and auxiliaries		69
32. Feedwater and Main Steam System	97	48
33. Circulating Water System		5
42. Electrical Power Supply System:		16
XX. Miscellaneous Systems:		1
Total	97	596

# US-346 DAVIS BESSE-1

**Operator:** FENOC (FIRST ENERGY NUCLEAR OPERATING CO.)

**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 879.0 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 2008

**Net Energy Production:** 6829.4 GW(e).h  
**Energy Availability Factor:** 86.6%  
**Load Factor:** 88.0%  
**Operating Factor:** 86.8%  
**Energy Unavailability Factor:** 13.4%  
**Total Off-line Time:** 1163 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	0.0	297.9	662.6	638.0	668.8	631.1	667.9	674.7	654.2	682.6	662.5	589.1	6829.4
<b>EAF (%)</b>	-1.7	51.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.5	86.6
<b>UCF (%)</b>	-1.7	51.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.5	86.6
<b>LF (%)</b>	0.0	48.7	101.5	100.8	102.3	99.7	102.1	103.2	101.6	102.6	102.8	88.6	88.0
<b>OF (%)</b>	0.0	52.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.4	86.8
<b>EUF (%)</b>	101.7	48.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5	13.4
<b>PUF (%)</b>	101.7	48.6	0.0	0.0	0.0	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	0.0	0.0	0.0	11.6	1.0
<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. 2008 Summary of Operation



## 5. Historical Summary

<b>Date of Construction Start:</b>	24 Mar 1971	<b>Lifetime Generation:</b>	154991.9 GW(e).h
<b>Date of First Criticality:</b>	12 Aug 1977	<b>Cumulative Energy Availability Factor:</b>	67.9%
<b>Date of Grid Connection:</b>	28 Aug 1977	<b>Cumulative Load Factor:</b>	65.3%
<b>Date of Commercial Operation:</b>	31 Jul 1978	<b>Cumulative Unit Capability Factor:</b>	68.0%
		<b>Cumulative Energy Unavailability Factor:</b>	32.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	1306.7	906.0	32.6	32.6	32.6	32.6	32.7	32.7	2090	47.3
1979	3129.1	906.0	39.4	37.2	39.4	37.2	39.4	37.2	4139	47.2
1980	2093.6	892.0	35.0	36.3	35.0	36.3	26.7	33.0	3171	36.1
1981	4363.4	888.0	67.4	45.1	67.4	45.1	56.1	39.5	5902	67.4
1982	3218.1	874.0	51.5	46.5	51.5	46.5	42.0	40.1	4508	51.5
1983	4883.3	874.0	72.3	51.1	72.3	51.1	63.8	44.3	6389	72.9
1984	4291.6	874.0	62.5	52.8	62.5	52.8	55.9	46.1	5486	62.5
1985	1942.9	862.0	30.9	50.0	30.9	50.0	25.7	43.4	2729	31.2
1986	3.5	860.0	1.3	44.4	1.3	44.4	0.0	38.4	116	1.3
1987	5064.0	860.0	82.8	48.3	82.8	48.3	67.2	41.4	7308	83.4
1988	1164.4	860.0	20.3	45.7	20.3	45.7	15.4	39.0	1891	21.5
1989	7322.1	870.0	97.1	50.2	97.1	50.2	96.0	43.9	8506	97.1
1990	4161.5	874.0	55.6	50.6	55.6	50.6	54.4	44.7	4867	55.6
1991	5843.9	874.0	78.6	52.7	78.6	52.7	76.3	47.1	6962	79.5
1992	7650.5	877.0	99.5	55.9	99.5	55.9	99.3	50.7	8742	99.5
1993	6083.4	871.0	82.7	57.6	82.7	57.6	79.7	52.5	7246	82.7
1994	6385.0	868.0	86.9	59.4	86.9	59.4	84.0	54.4	7667	87.5
1995	7670.6	869.0	100.0	61.7	100.0	61.7	100.8	57.1	8760	100.0
1996	6456.3	872.0	84.8	62.9	84.8	62.9	84.3	58.5	7452	84.8
1997	7183.4	873.0	93.4	64.5	93.4	64.5	93.9	60.3	8184	93.4
1998	6130.7	873.0	85.4	65.5	82.0	65.3	80.2	61.3	7181	82.0
1999	7370.0	873.0	94.9	66.9	94.9	66.7	96.4	62.9	8311	94.9
2000	6770.5	876.0	87.0	67.8	87.0	67.6	87.9	64.0	7633	86.9
2001	7690.8	882.0	99.8	69.1	99.8	69.0	99.5	65.6	8738	99.7
2002	929.0	882.0	12.4	66.8	12.4	66.7	12.0	63.4	1081	12.3
2003	0.0	882.0	0.0	64.2	0.0	64.0	0.0	60.9	0	0.0
2004	5778.4	882.0	75.6	64.6	75.6	64.5	74.6	61.4	6628	75.5
2005	7177.4	873.0	92.8	65.6	92.8	65.5	93.9	62.6	8125	92.8
2006	6375.4	891.0	83.0	66.2	83.0	66.1	81.7	63.2	7265	82.9
2007	7705.8	879.0	99.4	67.4	99.4	67.3	100.1	64.5	8712	99.5
2008	6829.4	894.0	86.6	68.0	86.6	67.9	88.0	65.3	7621	86.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		85			818	
B. Refuelling without a maintenance outage					14	
C. Inspection, maintenance or repair combined with refuelling	1076			1506		
D. Inspection, maintenance or repair without refuelling				225		
E. Testing of plant systems or component				12	0	
H. Nuclear regulatory requirement					0	54
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					17	9
Subtotal	1076	85	0	1743	849	63
Total		1161			2655	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		68
13. Reactor Auxiliary System:		5
15. Reactor Cooling System:		51
16. Steam generation system:		0
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries	85	15
32. Feedwater and Main Steam System		477
35. All other I&C Systems:		3
41. Main Generator System:		1
42. Electrical Power Supply System:		83
XX. Miscellaneous Systems		1
Total	85	708

# US-275 DIABLO CANYON-1

Operator: PGE (PACIFIC GAS &amp; ELECTRIC CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9884.2 GW(e).h  
 Energy Availability Factor: 100.0%  
 Load Factor: 100.3%  
 Operating Factor: 100.0%  
 Energy Unavailability Factor: 0.0%  
 Total Off-line Time: 0 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	834.8	791.9	846.5	821.0	794.8	819.3	843.9	843.5	813.9	820.9	813.7	839.9	9884.2
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 (%)	100.0	101.4	101.5	101.6	95.2	101.4	101.1	101.0	100.8	98.3	100.6	100.6	100.3
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 23 Apr 1968  
 Date of First Criticality: 29 Apr 1984  
 Date of Grid Connection: 11 Nov 1984  
 Date of Commercial Operation: 07 May 1985

Lifetime Generation: 191321.9 GW(e).h  
 Cumulative Energy Availability Factor: 86.4%  
 Cumulative Load Factor: 85.2%  
 Cumulative Unit Capability Factor: 86.4%  
 Cumulative Energy Unavailability Factor: 13.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	5234.2	1073.0	90.8	90.8	90.8	90.8	85.1	85.1	5206	90.8
1986	5316.2	1073.0	65.7	75.7	65.7	75.7	56.6	67.8	5757	65.7
1987	8284.2	1073.0	95.3	83.0	95.3	83.0	88.1	75.5	8340	95.2
1988	5276.1	1073.0	34.6	69.8	34.6	69.8	56.0	70.1	5555	63.2
1989	7199.9	1073.0	80.7	72.1	80.7	72.1	76.6	71.5	7069	80.7
1990	8713.5	1073.0	96.2	76.4	96.2	76.4	92.7	75.3	8425	96.2
1991	7366.3	1073.0	80.4	77.0	80.4	77.0	78.4	75.7	7125	81.3
1992	7454.7	1073.0	82.3	77.7	82.3	77.7	79.1	76.2	7224	82.2
1993	9028.0	1073.0	98.5	80.1	98.5	80.1	96.0	78.5	8630	98.5
1994	7372.0	1073.0	79.9	80.1	79.9	80.1	78.4	78.5	6991	79.8
1995	7451.8	1073.0	81.9	80.2	81.9	80.2	79.3	78.5	7175	81.9
1996	8786.8	1073.0	94.7	81.5	94.7	81.5	93.2	79.8	8316	94.7
1997	8195.0	1073.0	87.9	82.0	87.9	82.0	87.2	80.4	7700	87.9
1998	8967.8	1073.0	97.8	83.1	97.8	83.1	95.4	81.5	8564	97.8
1999	8224.8	1073.0	90.3	83.6	88.7	83.5	87.5	81.9	7764	88.6
2000	7853.5	1073.0	85.2	83.7	85.2	83.6	83.3	82.0	7485	85.2
2001	9504.6	1087.0	99.4	84.7	99.4	84.6	100.0	83.1	8708	99.4
2002	7048.2	1087.0	76.0	84.2	76.0	84.1	74.0	82.6	6652	75.9
2003	9585.4	1087.0	100.0	85.0	100.0	85.0	100.7	83.5	8760	100.0
2004	7233.9	1087.0	78.2	84.7	78.2	84.6	75.8	83.1	6869	78.2
2005	8323.4	1087.0	88.8	84.9	88.8	84.8	87.4	83.4	7775	88.8
2006	9945.0	1122.0	100.0	85.6	100.0	85.5	101.2	84.2	8760	100.0
2007	8868.3	1122.0	89.9	85.8	89.9	85.7	90.2	84.5	7870	89.8
2008	9884.2	1122.0	100.0	86.4	100.0	86.4	100.3	85.2	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					219	
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling				824		
D. Inspection, maintenance or repair without refuelling				79		
E. Testing of plant systems or component:				0		
H. Nuclear regulatory requirement					2	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					10	5
Subtotal	0	0	0	903	242	5
Total	0			1150		

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		3
14. Safety Systems		6
15. Reactor Cooling System:		7
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries:		13
32. Feedwater and Main Steam System		108
33. Circulating Water System		10
35. All other I&C Systems:		1
41. Main Generator System:		2
42. Electrical Power Supply System:		44
Total	0	195

## US-323 DIABLO CANYON-2

Operator: PGE (PACIFIC GAS &amp; ELECTRIC CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 7263.1 GW(e).h  
 Energy Availability Factor: 74.9%  
 Load Factor: 74.0%  
 Operating Factor: 74.9%  
 Energy Unavailability Factor: 25.1%  
 Total Off-line Time: 2206 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	827.7	42.6	0.0	451.4	849.4	819.0	844.6	422.4	638.6	715.8	811.8	839.8	7263.1
EAF (%)	100.0	8.5	0.1	61.9	100.0	100.0	100.0	51.6	82.8	91.5	100.0	100.0	74.9
UCF (%)	100.0	8.5	0.1	61.9	100.0	100.0	100.0	51.6	82.8	100.0	100.0	100.0	75.7
LF (%)	99.5	5.5	0.0	56.1	102.1	101.7	101.5	50.8	79.3	86.1	100.9	101.0	74.0
OF (%)	100.0	8.5	0.0	61.8	100.0	100.0	100.0	51.5	82.6	91.4	100.0	100.0	74.9
EUF (%)	0.0	91.5	99.9	38.1	0.0	0.0	0.0	48.4	17.2	8.5	0.0	0.0	25.1
PUF (%)	0.0	91.5	99.9	38.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.8
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.4	17.2	0.0	0.0	0.0	5.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.5	0.0	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 09 Dec 1970      Lifetime Generation: 188193.8 GW(e).h  
 Date of First Criticality: 19 Aug 1985      Cumulative Energy Availability Factor: 88.3%  
 Date of Grid Connection: 20 Oct 1985      Cumulative Load Factor: 86.1%  
 Date of Commercial Operation: 13 Mar 1986      Cumulative Unit Capability Factor: 88.4%  
    Cumulative Energy Unavailability Factor: 11.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	6548.2	1080.0	95.4	95.4	95.4	95.4	86.2	86.2	6729	95.4
1987	5728.8	1079.0	65.4	78.8	65.4	78.8	60.6	72.0	5752	65.7
1988	6243.3	1087.0	69.3	75.4	69.3	75.4	65.4	69.6	6086	69.3
1989	8616.0	1087.0	92.2	79.8	92.2	79.8	90.5	75.1	8072	92.1
1990	7578.1	1087.0	83.2	80.5	83.2	80.5	79.6	76.1	7284	83.2
1991	7718.5	1087.0	84.7	81.2	84.7	81.2	81.1	76.9	7420	84.7
1992	9247.7	1087.0	98.5	83.8	98.5	83.8	96.9	79.9	8651	98.5
1993	7796.2	1087.0	83.6	83.8	83.6	83.8	81.9	80.1	7324	83.6
1994	7896.1	1087.0	85.0	83.9	85.0	83.9	82.9	80.4	7439	84.9
1995	8821.0	1087.0	96.3	85.2	96.3	85.2	92.6	81.7	8430	96.2
1996	7932.9	1087.0	85.0	85.1	85.0	85.1	83.1	81.8	7459	84.9
1997	8883.5	1087.0	96.4	86.1	96.4	86.1	93.3	82.8	8441	96.4
1998	8159.0	1087.0	87.1	86.2	87.1	86.2	85.7	83.0	7624	87.0
1999	8443.7	1087.0	91.3	86.5	90.2	86.5	88.7	83.4	7902	90.2
2000	9188.5	1087.0	96.9	87.2	96.9	87.2	96.2	84.3	8512	96.9
2001	8658.4	1087.0	91.9	87.5	91.9	87.5	90.9	84.7	8051	91.9
2002	9286.1	1087.0	99.6	88.3	98.9	88.2	97.5	85.5	8663	98.9
2003	7725.2	1087.0	82.5	87.9	82.5	87.8	81.1	85.2	7225	82.5
2004	8017.9	1087.0	85.8	87.8	85.8	87.7	84.0	85.2	7535	85.8
2005	9441.7	1087.0	100.0	88.4	100.0	88.3	99.1	85.9	8760	100.0
2006	8529.6	1087.0	88.3	88.4	88.3	88.3	89.6	86.0	7734	88.3
2007	9720.1	1118.0	100.0	89.0	100.0	88.9	99.2	86.7	8760	100.0
2008	7263.1	1118.0	75.7	88.4	74.9	88.3	74.0	86.1	6578	74.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		484			144	
B. Refuelling without a maintenance outage					13	
C. Inspection, maintenance or repair combined with refuelling	1654			682		
D. Inspection, maintenance or repair without refuelling				16		
E. Testing of plant systems or component				1		
H. Nuclear regulatory requirement					11	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					28	6
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			63			
Subtotal	1654	484	63	699	196	6
Total		2201			901	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		11
13. Reactor Auxiliary Systems		7
15. Reactor Cooling Systems		6
31. Turbine and auxiliaries		23
32. Feedwater and Main Steam System		23
33. Circulating Water System		2
35. All other I&C Systems		9
41. Main Generator Systems		10
42. Electrical Power Supply Systems	484	50
Total	484	141

# US-315 DONALD COOK-1

**Operator:** IMPCO (INDIANA MICHIGAN POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1009.0 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 2008

**Net Energy Production:** 5639.7 GW(e).h  
**Energy Availability Factor:** 61.6%  
**Load Factor:** 63.6%  
**Operating Factor:** 61.6%  
**Energy Unavailability Factor:** 38.4%  
**Total Off-line Time:** 3377 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	812.8	652.2	617.8	7.2	792.1	747.7	760.9	757.5	491.5	0.0	0.0	0.0	5639.7
<b>EAF (%)</b>	100.0	87.8	80.7	3.6	100.0	100.0	100.0	100.0	66.1	0.0	0.0	0.0	61.6
<b>UCF (%)</b>	100.0	87.8	80.7	3.6	100.0	100.0	100.0	100.0	66.1	0.0	0.0	0.0	61.6
<b>LF (%)</b>	108.3	92.9	82.4	1.0	105.5	102.9	101.4	100.9	67.7	0.0	0.0	0.0	63.6
<b>OF (%)</b>	100.0	87.8	80.6	3.5	100.0	100.0	100.0	100.0	66.1	0.0	0.0	0.0	61.6
<b>EUF (%)</b>	0.0	12.2	19.3	96.4	0.0	0.0	0.0	0.0	33.9	100.0	100.0	100.0	38.4
<b>PUF (%)</b>	0.0	0.0	19.3	96.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5
<b>UCLF (%)</b>	0.0	12.2	0.0	0.0	0.0	0.0	0.0	0.0	33.9	100.0	100.0	100.0	28.9
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	25 Mar 1969	<b>Lifetime Generation:</b>	198902.3 GW(e).h
<b>Date of First Criticality:</b>	18 Jan 1975	<b>Cumulative Energy Availability Factor:</b>	69.5%
<b>Date of Grid Connection:</b>	10 Feb 1975	<b>Cumulative Load Factor:</b>	66.4%
<b>Date of Commercial Operation:</b>	28 Aug 1975	<b>Cumulative Unit Capability Factor:</b>	69.7%
		<b>Cumulative Energy Unavailability Factor:</b>	30.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	2557.1	848.0	84.7	84.7	84.7	84.7	83.4	83.4	3141	85.5
1976	6804.9	983.0	79.2	80.6	79.2	80.6	78.8	80.0	7298	83.1
1977	4785.8	1044.0	52.4	68.2	52.4	68.2	52.3	67.9	6658	76.0
1978	6286.9	1044.0	68.7	68.4	68.7	68.4	68.7	68.1	6438	73.5
1979	5660.2	1044.0	61.9	66.9	61.9	66.9	61.9	66.7	5666	64.7
1980	6461.3	1044.0	79.5	69.3	74.8	68.4	70.5	67.4	6470	73.7
1981	6781.5	1044.0	77.1	70.5	77.1	69.8	74.2	68.5	6663	76.1
1982	5352.7	1044.0	64.2	69.6	64.2	69.0	58.5	67.1	5487	62.6
1983	5286.7	1030.0	64.3	69.0	64.3	68.4	58.6	66.1	5628	64.2
1984	7550.8	1020.0	91.3	71.4	91.3	70.9	84.3	68.0	8016	91.3
1985	2116.1	1020.0	29.9	67.4	29.9	66.9	23.7	63.8	2489	28.4
1986	6650.1	1020.0	85.5	69.0	85.5	68.6	74.4	64.7	7464	85.2
1987	5033.8	1020.0	68.2	68.9	68.2	68.5	56.3	64.0	5917	67.5
1988	7467.8	1020.0	95.5	70.9	95.5	70.5	83.3	65.5	8379	95.4
1989	5433.0	1020.0	69.9	70.8	69.9	70.5	60.8	65.2	6069	69.3
1990	6301.6	1020.0	79.2	71.4	79.2	71.1	70.5	65.5	6939	79.2
1991	7338.2	1013.0	86.0	72.3	86.0	72.0	82.7	66.5	7524	85.9
1992	4990.7	1008.0	65.1	71.9	65.1	71.6	56.3	66.0	5690	64.8
1993	8759.4	1006.0	100.0	73.4	100.0	73.1	99.3	67.7	8760	100.0
1994	5759.5	1000.0	71.0	73.2	71.0	73.0	65.7	67.6	6214	70.9
1995	5396.8	1000.0	66.4	72.9	66.4	72.7	61.6	67.4	5809	66.3
1996	8373.3	1000.0	97.6	74.0	97.6	73.8	95.3	68.6	8574	97.6
1997	4545.9	1000.0	52.4	73.1	52.4	72.9	51.9	67.9	4608	52.6
1998	0.0	1000.0	0.0	70.0	0.0	69.8	0.0	65.1	0	0.0
1999	0.0	1000.0	0.0	67.2	0.0	67.0	0.0	62.4	0	0.0
2000	129.8	1000.0	2.8	64.7	2.8	64.5	1.5	60.1	242	2.8
2001	7797.9	1000.0	90.6	65.7	89.5	65.4	89.0	61.1	7840	89.5
2002	7740.9	1000.0	88.9	66.5	88.9	66.3	88.4	62.1	7782	88.8
2003	6570.1	1000.0	74.1	66.8	74.1	66.6	75.0	62.6	6489	74.1
2004	8831.5	1000.0	97.7	67.8	97.7	67.6	100.5	63.8	8588	97.8
2005	8055.8	1016.0	90.7	68.6	90.7	68.4	90.5	64.7	7940	90.6
2006	7296.2	1016.0	82.9	69.0	82.9	68.8	82.0	65.3	7256	82.8
2007	9252.7	1009.0	99.6	70.0	99.6	69.8	104.7	66.5	8728	99.6
2008	5639.7	1009.0	61.6	69.7	61.6	69.5	63.6	66.4	5407	61.6



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		2537			231	
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling	838			1152		
D. Inspection, maintenance or repair without refuelling				131		
E. Testing of plant systems or component				9	6	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				2		
H. Nuclear regulatory requirement					3	22
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					855	2
P. Fire					14	
Subtotal	838	2537	0	1294	1121	24
Total		3375			2439	

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		19
14. Safety Systems		9
15. Reactor Cooling System		36
16. Steam generation system		7
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	2537	60
32. Feedwater and Main Steam System		20
33. Circulating Water System		38
35. All other I&C Systems		0
41. Main Generator System		20
42. Electrical Power Supply System		17
Total	2537	227

## US-316 DONALD COOK-2

**Operator:** IMPCO (INDIANA MICHIGAN POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1060.0 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 2008

**Net Energy Production:** 9396.6 GW(e).h  
**Energy Availability Factor:** 98.5%  
**Load Factor:** 100.9%  
**Operating Factor:** 98.5%  
**Energy Unavailability Factor:** 1.5%  
**Total Off-line Time:** 134 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	811.8	774.1	827.6	792.7	783.7	776.8	784.9	642.4	769.6	811.9	798.9	822.3	9396.6
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	97.2	100.0	100.0	84.8	100.0	100.0	100.0	100.0	98.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	97.3	100.0	100.0	84.8	100.0	100.0	100.0	100.0	98.5
<b>LF (%)</b>	102.9	104.9	105.1	103.9	99.4	101.8	99.5	81.5	100.8	102.9	104.5	104.3	100.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	97.2	100.0	100.0	84.8	100.0	100.0	100.0	100.0	98.5
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	2.8	0.0	0.0	15.2	0.0	0.0	0.0	0.0	1.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	2.8	0.0	0.0	15.2	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	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	25 Mar 1969	<b>Lifetime Generation:</b>	185076.3 GW(e).h
<b>Date of First Criticality:</b>	10 Mar 1978	<b>Cumulative Energy Availability Factor:</b>	68.2%
<b>Date of Grid Connection:</b>	22 Mar 1978	<b>Cumulative Load Factor:</b>	64.7%
<b>Date of Commercial Operation:</b>	01 Jul 1978	<b>Cumulative Unit Capability Factor:</b>	68.4%
		<b>Cumulative Energy Unavailability Factor:</b>	31.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	3122.8	1078.0	65.4	65.4	65.4	65.4	65.3	65.3	3411	77.2
1979	5953.5	1082.0	62.8	63.7	62.8	63.7	62.8	63.7	5773	65.9
1980	6691.2	1082.0	80.1	70.3	74.8	68.1	70.4	66.4	6535	74.4
1981	6384.8	1082.0	71.2	70.5	71.2	69.0	67.4	66.6	6178	70.5
1982	6995.6	1082.0	77.2	72.0	77.2	70.8	73.8	68.2	6738	76.9
1983	7013.6	1071.0	78.3	73.1	78.3	72.2	74.8	69.4	6835	78.0
1984	5364.4	1060.0	59.2	71.0	59.2	70.2	57.6	67.6	5196	59.2
1985	5683.6	1060.0	66.9	70.5	66.9	69.8	61.2	66.8	5852	66.8
1986	4335.6	1060.0	61.5	69.4	61.5	68.8	46.7	64.4	5389	61.5
1987	5026.6	1060.0	71.4	69.6	71.4	69.1	54.1	63.4	6248	71.3
1988	2323.3	1060.0	30.9	66.0	30.9	65.5	25.0	59.7	2715	30.9
1989	6661.0	1060.0	74.4	66.7	74.4	66.2	71.7	60.8	6518	74.4
1990	4813.3	1060.0	55.4	65.8	55.4	65.4	51.8	60.1	4854	55.4
1991	8185.9	1065.0	92.2	67.8	91.5	67.3	87.7	62.1	8013	91.5
1992	1427.3	1072.0	20.5	64.5	20.5	64.1	15.2	58.9	1714	19.5
1993	7553.8	1070.0	96.6	66.6	96.6	66.2	80.6	60.3	8459	96.6
1994	3531.5	1060.0	54.4	65.8	54.4	65.5	38.0	58.9	4757	54.3
1995	8602.5	1060.0	94.5	67.4	94.5	67.1	92.6	60.8	8268	94.4
1996	8022.6	1060.0	87.0	68.5	87.0	68.2	86.2	62.2	7641	87.0
1997	5875.2	1060.0	64.9	68.3	64.9	68.0	63.3	62.2	5705	65.1
1998	0.0	1060.0	0.0	65.0	0.0	64.7	0.0	59.2	0	0.0
1999	0.0	1060.0	0.0	62.0	0.0	61.7	0.0	56.5	0	0.0
2000	4789.8	1060.0	51.9	61.6	51.9	61.3	51.4	56.3	4557	51.9
2001	7963.4	1060.0	87.8	62.7	87.8	62.4	85.8	57.5	7690	87.8
2002	7687.7	1060.0	83.8	63.5	83.8	63.3	82.8	58.5	7335	83.7
2003	7112.2	1060.0	75.5	64.0	75.5	63.7	76.6	59.2	6610	75.5
2004	7938.5	1060.0	84.3	64.8	84.3	64.5	85.3	60.2	7407	84.3
2005	9415.5	1077.0	98.2	66.0	98.2	65.8	99.8	61.7	8603	98.2
2006	8388.8	1077.0	88.3	66.8	88.3	66.6	88.9	62.6	7732	88.3
2007	8124.5	1060.0	85.3	67.4	85.3	67.2	87.5	63.5	7492	85.5
2008	9396.6	1060.0	98.5	68.4	98.5	68.2	100.9	64.7	8650	98.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					534	
B. Refuelling without a maintenance					15	
C. Inspection, maintenance or repair combined with refuelling				1157		
D. Inspection, maintenance or repair without refuelling	133			115	127	
E. Testing of plant systems or component				0		
H. Nuclear regulatory requirement					3	22
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					722	
Z. Others					15	
Subtotal	133	0	0	1272	1416	23
Total	133			2711		

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		50
15. Reactor Cooling Systems		86
16. Steam generation system		174
17. Safety I&C Systems (excluding reactor I&C)		8
31. Turbine and auxiliaries		25
32. Feedwater and Main Steam System		21
33. Circulating Water System		36
35. All other I&C Systems		14
41. Main Generator Systems		44
42. Electrical Power Supply Systems		45
Total	0	516

## US-237 DRESDEN-2

**Operator:** EXELON (Exelon Generation)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 867.0 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 2008

**Net Energy Production:** 7469.5 GW(e).h  
**Energy Availability Factor:** 98.4%  
**Load Factor:** 98.1%  
**Operating Factor:** 98.3%  
**Energy Unavailability Factor:** 1.6%  
**Total Off-line Time:** 145 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	647.6	605.7	643.6	626.3	646.4	623.5	645.9	645.8	476.2	638.0	626.7	643.7	7469.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.1	100.0	100.0	100.0	98.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.1	100.0	100.0	100.0	98.4
<b>LF (%)</b>	100.4	100.4	99.9	100.3	100.2	99.9	100.1	100.1	76.3	98.9	100.3	99.8	98.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.0	99.9	100.0	100.0	98.3
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.9	0.0	0.0	0.0	1.6
<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	0.0	0.0	0.0	0.0	0.0	19.9	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	10 Jan 1966	<b>Lifetime Generation:</b>	179838.2 GW(e).h
<b>Date of First Criticality:</b>	07 Jan 1970	<b>Cumulative Energy Availability Factor:</b>	77.3%
<b>Date of Grid Connection:</b>	13 Apr 1970	<b>Cumulative Load Factor:</b>	67.0%
<b>Date of Commercial Operation:</b>	09 Jun 1970	<b>Cumulative Unit Capability Factor:</b>	77.3%
		<b>Cumulative Energy Unavailability Factor:</b>	22.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1970	1002.0	804.0	100.0	100.0	100.0	100.0	23.9	23.9	1945	37.9
1971	2806.3	815.0	100.0	100.0	100.0	100.0	39.3	33.6	5694	65.0
1972	3370.5	815.0	100.0	100.0	100.0	100.0	47.1	38.8	5240	59.7
1973	5014.5	800.0	90.8	97.5	90.8	97.5	71.6	47.8	7672	87.6
1974	3376.0	800.0	58.3	89.0	58.3	89.0	48.2	47.9	5113	58.4
1975	2957.0	800.0	42.2	80.7	42.2	80.7	42.2	46.9	4826	55.1
1976	4374.4	781.0	64.1	78.3	64.1	78.3	63.8	49.4	6660	75.8
1977	3538.1	772.0	52.4	75.0	52.4	75.0	52.3	49.8	6297	71.9
1978	5704.5	772.0	84.4	76.0	84.4	76.0	84.4	53.7	8244	94.1
1979	4942.9	772.0	73.1	75.7	73.1	75.7	73.1	55.6	7141	81.5
1980	4580.4	772.0	93.5	77.4	93.5	77.4	67.5	56.7	8193	93.3
1981	3416.0	772.0	60.7	76.0	60.1	75.9	50.5	56.2	5260	60.0
1982	5123.1	772.0	93.0	77.3	92.4	77.2	75.8	57.7	8094	92.4
1983	3402.2	772.0	59.2	76.0	58.9	75.9	50.3	57.2	5076	57.9
1984	4468.4	772.0	72.9	75.8	72.9	75.7	65.9	57.8	6402	72.9
1985	3106.0	772.0	54.5	74.4	54.5	74.3	45.9	57.0	4678	53.4
1986	4655.7	772.0	77.2	74.6	77.2	74.5	68.8	57.7	6761	77.2
1987	3362.6	772.0	61.0	73.8	61.0	73.8	49.7	57.3	5342	61.0
1988	4325.2	772.0	78.9	74.1	78.9	74.0	63.8	57.6	6931	78.9
1989	4751.7	772.0	80.2	74.4	80.2	74.3	70.3	58.3	7023	80.2
1990	4116.9	772.0	67.6	74.1	67.6	74.0	60.9	58.4	5920	67.6
1991	2984.2	772.0	58.0	73.4	58.0	73.3	44.1	57.7	5031	57.4
1992	4185.8	772.0	84.5	73.8	84.5	73.8	61.7	57.9	7419	84.5
1993	3058.6	772.0	54.7	73.0	54.7	73.0	45.2	57.4	4790	54.7
1994	4086.1	772.0	66.3	72.8	66.3	72.7	60.4	57.5	5808	66.3
1995	1890.5	772.0	33.5	71.3	33.5	71.2	28.0	56.4	2938	33.5
1996	2161.4	772.0	42.5	70.2	42.5	70.1	31.9	55.4	3731	42.5
1997	5578.4	772.0	89.4	70.9	89.4	70.8	82.5	56.4	7738	88.3
1998	5632.9	772.0	85.6	71.4	85.6	71.3	83.3	57.4	7496	85.6
1999	6229.5	772.0	92.7	72.1	92.7	72.0	92.1	58.5	8122	92.7
2000	6867.4	772.0	99.6	73.0	99.6	72.9	101.3	59.9	8747	99.6
2001	6072.7	772.0	91.2	73.6	91.2	73.5	89.8	60.8	8005	91.4
2002	7527.5	850.0	100.0	74.4	100.0	74.4	101.1	62.2	8760	100.0
2003	6703.1	850.0	92.0	75.0	92.0	75.0	90.0	63.1	7999	91.3
2004	5909.3	850.0	80.2	75.2	80.2	75.1	79.1	63.6	7045	80.2
2005	6590.1	850.0	88.0	75.6	88.0	75.5	88.5	64.3	7710	88.0
2006	7273.2	867.0	96.9	76.2	96.9	76.2	95.8	65.3	8485	96.9
2007	6972.7	867.0	92.8	76.7	92.8	76.6	91.8	66.1	8132	92.8
2008	7469.5	867.0	98.4	77.3	98.4	77.3	98.1	67.0	8639	98.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		143			593	
B. Refuelling without a maintenance					19	
C. Inspection, maintenance or repair combined with refuelling				1268		
D. Inspection, maintenance or repair without refuelling				69	1	
E. Testing of plant systems or component				10	7	
H. Nuclear regulatory requirement					5	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					65	3
Subtotal	0	143	0	1347	690	3
Total		143			2040	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		76
13. Reactor Auxiliary System:		11
14. Safety Systems		20
15. Reactor Cooling System:		106
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	143	140
32. Feedwater and Main Steam System		24
35. All other I&C Systems		20
41. Main Generator System:		52
42. Electrical Power Supply System:		27
XX. Miscellaneous Systems		12
Total	143	499

## US-249 DRESDEN-3

**Operator:** EXELON (Exelon Generation)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 867.0 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 2008

**Net Energy Production:** 6919.1 GW(e).h  
**Energy Availability Factor:** 92.4%  
**Load Factor:** 90.9%  
**Operating Factor:** 92.4%  
**Energy Unavailability Factor:** 7.6%  
**Total Off-line Time:** 666 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	437.9	606.1	646.1	626.6	646.2	625.4	645.9	638.0	617.2	571.6	207.8	650.2	6919.1
<b>EAF (%)</b>	69.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	38.9	100.0	92.4
<b>UCF (%)</b>	69.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	38.9	100.0	92.4
<b>LF (%)</b>	67.9	100.4	100.3	100.4	100.2	100.2	100.1	98.9	98.9	88.6	33.2	100.8	90.9
<b>OF (%)</b>	69.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	38.8	100.0	92.4
<b>EUF (%)</b>	30.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	61.1	0.0	7.6
<b>PUF (%)</b>	30.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	61.1	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. 2008 Summary of Operation



## 5. Historical Summary

<b>Date of Construction Start:</b>	14 Oct 1966	<b>Lifetime Generation:</b>	172988.2 GW(e).h
<b>Date of First Criticality:</b>	12 Jan 1971	<b>Cumulative Energy Availability Factor:</b>	73.6%
<b>Date of Grid Connection:</b>	22 Jul 1971	<b>Cumulative Load Factor:</b>	66.9%
<b>Date of Commercial Operation:</b>	16 Nov 1971	<b>Cumulative Unit Capability Factor:</b>	73.6%
		<b>Cumulative Energy Unavailability Factor:</b>	26.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1971	590.0	794.0	100.0	100.0	100.0	100.0	49.4	49.4	814	55.6
1972	5175.6	815.0	100.0	100.0	100.0	100.0	72.3	69.0	7549	85.9
1973	3703.6	800.0	69.2	85.9	69.2	85.9	52.8	61.6	5905	67.4
1974	3608.9	800.0	65.8	79.6	65.8	79.6	51.5	58.5	5778	66.0
1975	2211.2	800.0	31.5	68.2	31.5	68.2	31.6	52.0	4505	51.4
1976	4037.2	781.0	58.7	66.4	58.7	66.4	58.8	53.3	7231	82.3
1977	5186.4	773.0	76.6	68.0	76.6	68.0	76.6	57.0	8072	92.1
1978	3835.3	773.0	56.6	66.4	56.6	66.4	56.6	56.9	6280	71.7
1979	3482.9	773.0	51.4	64.6	51.4	64.6	51.4	56.3	5930	67.7
1980	4335.5	773.0	72.3	65.5	72.3	65.5	63.9	57.1	6307	71.8
1981	5177.7	773.0	95.1	68.3	94.5	68.3	76.5	59.0	8256	94.2
1982	3896.4	773.0	64.3	68.0	63.8	67.9	57.5	58.8	5562	63.5
1983	4159.7	773.0	73.1	68.4	73.1	68.3	61.4	59.1	6401	73.1
1984	2135.5	773.0	37.7	66.1	37.7	66.0	31.5	57.0	3309	37.7
1985	4401.3	773.0	75.6	66.8	75.6	66.7	65.0	57.5	6618	75.5
1986	1498.3	773.0	28.1	64.2	28.1	64.2	22.1	55.2	2456	28.0
1987	4395.5	773.0	75.3	64.9	75.3	64.8	64.9	55.8	6591	75.2
1988	4168.4	773.0	71.5	65.3	71.5	65.2	61.4	56.1	6278	71.5
1989	5119.5	773.0	82.6	66.2	82.6	66.2	75.6	57.2	7235	82.6
1990	5149.8	773.0	83.0	67.1	83.0	67.0	76.1	58.2	7272	83.0
1991	2584.2	773.0	59.9	66.7	59.9	66.7	38.2	57.2	5247	59.9
1992	3077.1	773.0	61.1	66.5	61.1	66.4	45.3	56.6	5364	61.1
1993	4969.0	773.0	80.4	67.1	80.4	67.1	73.4	57.4	7040	80.4
1994	1666.4	773.0	34.3	65.7	34.3	65.7	24.6	56.0	3009	34.3
1995	3477.3	773.0	59.5	65.4	59.5	65.4	51.4	55.8	5209	59.5
1996	2962.1	773.0	48.9	64.8	48.9	64.7	43.6	55.3	4273	48.6
1997	4046.2	773.0	68.6	64.9	68.6	64.9	59.8	55.5	5900	67.4
1998	6234.6	773.0	93.1	66.0	93.1	65.9	92.1	56.8	8157	93.1
1999	6130.0	773.0	91.1	66.8	91.1	66.8	90.5	58.0	7978	91.1
2000	6365.1	773.0	93.8	67.8	93.8	67.7	93.7	59.2	8243	93.8
2001	6466.0	773.0	95.4	68.7	95.4	68.6	95.5	60.4	8359	95.4
2002	6060.9	850.0	90.5	69.4	90.5	69.4	87.3	61.3	7915	90.4
2003	6963.9	850.0	94.2	70.2	94.2	70.2	93.5	62.4	8206	93.7
2004	6436.9	850.0	85.9	70.7	85.9	70.7	86.2	63.2	7544	85.9
2005	7032.4	850.0	93.3	71.5	93.3	71.4	94.4	64.2	8169	93.2
2006	7171.9	867.0	94.7	72.2	94.7	72.2	94.4	65.1	8298	94.7
2007	7558.1	867.0	99.5	73.0	99.5	73.0	99.5	66.2	8715	99.5
2008	6919.1	867.0	92.4	73.6	92.4	73.6	90.9	66.9	8118	92.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					655	
B. Refuelling without a maintenance					23	
C. Inspection, maintenance or repair combined with refuelling	440			1323		
D. Inspection, maintenance or repair without refuelling	224			92		
E. Testing of plant systems or component:				1	5	
H. Nuclear regulatory requirement				9	1	1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				9	10	1
Z. Others					2	
Subtotal	664	0	0	1434	696	2
Total	664			2132		

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		17
13. Reactor Auxiliary System:		2
14. Safety Systems		54
15. Reactor Cooling System:		54
17. Safety I&C Systems (excluding reactor I&C)		65
31. Turbine and auxiliaries		187
32. Feedwater and Main Steam System		60
33. Circulating Water System		6
35. All other I&C Systems		1
41. Main Generator System:		15
42. Electrical Power Supply System:		90
XX. Miscellaneous Systems		69
Total	0	627

# US-331 DUANE ARNOLD-1

**Operator:** FPLDUANE (FPL ENERGY DUANE ARNOLD)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 580.0 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 2008

**Net Energy Production:** 5282.8 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. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	457.1	427.6	452.7	440.1	450.9	425.1	440.4	430.6	431.8	451.8	438.7	435.9	5282.8
<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>	105.9	105.9	105.1	105.4	104.5	101.8	102.1	99.8	103.4	104.7	104.9	101.0	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	22 Jun 1970	<b>Lifetime Generation:</b>	118484.4 GW(e).h
<b>Date of First Criticality:</b>	23 Mar 1974	<b>Cumulative Energy Availability Factor:</b>	78.5%
<b>Date of Grid Connection:</b>	19 May 1974	<b>Cumulative Load Factor:</b>	74.2%
<b>Date of Commercial Operation:</b>	01 Feb 1975	<b>Cumulative Unit Capability Factor:</b>	78.6%
		<b>Cumulative Energy Unavailability Factor:</b>	21.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	2099.6	515.0	79.4	79.4	79.4	79.4	50.9	50.9	6298	78.6
1976	2489.4	515.0	55.1	66.7	55.1	66.7	55.0	53.0	6847	77.9
1977	2897.8	515.0	64.3	65.9	64.3	65.9	64.2	56.9	6908	78.9
1978	1227.5	515.0	27.2	56.0	27.2	56.0	27.2	49.3	2902	33.1
1979	2898.9	515.0	64.3	57.7	64.3	57.7	64.3	52.3	6830	78.0
1980	2796.3	515.0	74.8	60.6	73.2	60.3	61.8	53.9	6456	73.5
1981	2219.5	515.0	69.3	61.8	69.3	61.6	49.2	53.3	6108	69.7
1982	2280.4	515.0	74.2	63.4	74.2	63.2	50.5	52.9	6543	74.7
1983	2324.3	515.0	61.8	63.2	61.8	63.0	51.5	52.8	5503	62.8
1984	2717.6	515.0	72.2	64.1	72.2	64.0	60.1	53.5	6402	72.9
1985	1940.5	515.0	52.6	63.1	52.6	62.9	43.0	52.5	4711	53.8
1986	3192.8	515.0	81.5	64.6	81.5	64.5	70.8	54.1	7495	85.6
1987	2546.6	515.0	62.0	64.4	62.0	64.3	56.4	54.3	5513	62.9
1988	3520.2	520.0	72.3	65.0	72.3	64.9	77.0	55.9	7128	81.1
1989	3143.6	536.0	62.5	64.8	62.5	64.7	66.9	56.7	6561	74.9
1990	3021.0	538.0	74.7	65.5	74.7	65.4	64.1	57.2	6498	74.2
1991	4146.8	532.0	93.9	67.2	93.9	67.1	88.9	59.1	8217	93.8
1992	3434.6	515.0	80.5	67.9	80.5	67.8	75.9	60.0	7112	81.0
1993	3241.4	515.0	76.6	68.4	76.5	68.3	71.8	60.6	6755	77.1
1994	4108.4	515.0	92.0	69.6	92.0	69.5	91.1	62.2	8078	92.2
1995	3737.0	515.0	82.4	70.2	82.4	70.1	82.8	63.1	7253	82.8
1996	3938.5	520.0	89.9	71.1	89.9	71.0	86.2	64.2	7906	90.0
1997	4155.5	520.0	92.7	72.0	92.7	71.9	91.2	65.4	8125	92.8
1998	3839.2	520.0	85.2	72.6	85.2	72.5	84.3	66.2	7477	85.4
1999	3649.0	520.0	83.0	73.0	83.0	72.9	80.1	66.7	7267	83.0
2000	4455.7	520.0	97.4	73.9	97.4	73.9	97.5	67.9	8553	97.4
2001	3860.6	565.0	85.4	74.4	85.4	74.3	84.1	68.5	7473	85.3
2002	4581.1	565.0	95.1	75.2	93.6	75.0	92.7	69.5	8147	93.0
2003	3998.6	565.0	83.8	75.5	83.8	75.4	80.8	69.9	7209	82.3
2004	4929.9	565.0	97.9	76.3	97.9	76.2	99.3	71.0	8596	97.9
2005	4544.5	562.0	90.0	76.8	90.0	76.7	92.3	71.7	7882	90.0
2006	5095.4	581.0	98.9	77.5	98.9	77.4	100.1	72.7	8664	98.9
2007	4518.9	580.0	86.7	77.8	86.7	77.7	88.9	73.2	7598	86.7
2008	5282.8	580.0	100.0	78.6	100.0	78.5	103.7	74.2	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					421	
B. Refuelling without a maintenance					44	
C. Inspection, maintenance or repair combined with refuelling				862		
D. Inspection, maintenance or repair without refuelling				238	0	
E. Testing of plant systems or component:				20	3	
H. Nuclear regulatory requirement				47	18	10
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				9	41	4
Subtotal	0	0	0	1176	527	14
Total	0			1717		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		5
13. Reactor Auxiliary System:		12
14. Safety Systems		17
15. Reactor Cooling System:		234
17. Safety I&C Systems (excluding reactor I&C)		6
31. Turbine and auxiliaries		46
32. Feedwater and Main Steam System		35
35. All other I&C Systems:		2
41. Main Generator System:		6
42. Electrical Power Supply System:		21
XX. Miscellaneous Systems		2
Total	0	386

# US-341 ENRICO FERMI-2

Operator: DETED (DETROIT EDISON CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9614.3 GW(e).h  
 Energy Availability Factor: 99.1%  
 Load Factor: 97.6%  
 Operating Factor: 99.1%  
 Energy Unavailability Factor: 0.9%  
 Total Off-line Time: 78 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	824.3	687.9	832.2	801.3	823.7	782.5	808.5	810.5	785.5	825.6	803.2	829.0	9614.3
EAF (%)	98.9	90.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1
UCF (%)	98.9	90.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1
LF (%)	98.7	88.1	99.7	99.2	98.7	96.9	96.9	97.1	97.2	98.9	99.4	99.3	97.6
OF (%)	98.8	90.2	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1
EUF (%)	1.1	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
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 (%)	1.1	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 26 Sep 1972      Lifetime Generation: 147248.2 GW(e).h  
 Date of First Criticality: 21 Jun 1985      Cumulative Energy Availability Factor: 77.9%  
 Date of Grid Connection: 21 Sep 1986      Cumulative Load Factor: 74.9%  
 Date of Commercial Operation: 23 Jan 1988      Cumulative Unit Capability Factor: 77.9%  
    Cumulative Energy Unavailability Factor: 22.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	4060.1	1093.0	57.0	57.0	57.0	57.0	45.0	45.0	4719	57.2
1989	5230.7	1093.0	63.4	60.3	63.4	60.3	54.6	50.0	5575	63.6
1990	7118.3	1059.0	82.3	67.6	82.3	67.6	76.7	58.9	7266	82.9
1991	6180.9	1059.0	72.8	68.9	72.8	68.9	66.6	60.8	6466	73.8
1992	7356.8	1060.0	79.1	71.0	79.1	71.0	79.0	64.5	7019	79.9
1993	8284.7	1085.0	92.1	74.6	92.1	74.6	87.2	68.3	8076	92.2
1994	0.0	1085.0	0.0	63.7	0.0	63.7	0.0	58.4	0	0.0
1995	5132.0	997.0	71.7	64.7	71.7	64.7	58.7	58.4	6509	74.3
1996	4790.0	876.0	58.2	64.1	58.2	64.1	62.3	58.8	5859	66.7
1997	5579.9	1000.0	70.5	64.7	70.5	64.7	63.6	59.3	5461	62.3
1998	7146.8	1098.0	78.4	66.0	78.4	66.0	74.3	60.7	6868	78.4
1999	9484.7	1081.0	99.3	68.9	99.3	68.9	100.1	64.1	8698	99.3
2000	8237.8	1083.0	85.7	70.2	85.7	70.2	86.6	65.9	7514	85.5
2001	8564.0	1089.0	89.3	71.6	89.3	71.6	89.8	67.7	7837	89.5
2002	9302.9	1089.0	98.5	73.5	98.5	73.5	97.5	69.7	8630	98.5
2003	8127.8	1089.0	85.3	74.2	85.3	74.2	85.2	70.7	7479	85.4
2004	8453.1	1089.0	88.2	75.1	88.2	75.1	88.4	71.8	7764	88.4
2005	8767.6	1111.0	90.8	76.0	90.8	76.0	90.1	72.9	7955	90.8
2006	7497.3	1101.0	80.9	76.3	80.9	76.3	77.7	73.1	7095	81.0
2007	8318.4	1122.0	86.1	76.8	86.1	76.8	84.6	73.7	7542	86.1
2008	9614.3	1122.0	99.1	77.9	99.1	77.9	97.6	74.9	8706	99.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		75		10	1002	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling				675		
D. Inspection, maintenance or repair without refuelling				214	2	
H. Nuclear regulatory requirement					2	
J. Grid limitation, failure or grid unavailability					6	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	
Subtotal	0	75	0	899	1022	0
Total		75			1921	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		38
12. Reactor I&C Systems		23
13. Reactor Auxiliary Systems		56
14. Safety Systems		16
15. Reactor Cooling Systems	75	21
17. Safety I&C Systems (excluding reactor I&C)		19
31. Turbine and auxiliaries		472
32. Feedwater and Main Steam System		6
33. Circulating Water System		2
35. All other I&C Systems		16
41. Main Generator Systems		164
42. Electrical Power Supply Systems		109
XX. Miscellaneous Systems		54
Total	75	996

# US-348 FARLEY-1

**Operator:** ALP (ALABAMA POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 851.0 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 2008

**Net Energy Production:** 7281.5 GW(e).h  
**Energy Availability Factor:** 97.7%  
**Load Factor:** 97.4%  
**Operating Factor:** 97.7%  
**Energy Unavailability Factor:** 2.3%  
**Total Off-line Time:** 205 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	645.1	601.2	642.6	621.4	638.0	616.4	444.5	590.7	616.1	639.2	582.7	643.4	7281.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	76.6	100.0	100.0	100.0	95.8	100.0	97.7
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	76.7	100.0	100.0	100.0	95.8	100.0	97.7
<b>LF (%)</b>	101.9	101.5	101.5	101.4	100.8	100.6	70.2	93.3	100.6	101.0	95.1	101.6	97.4
<b>OF (%)</b>	100.0	100.0	99.9	100.0	100.0	100.0	76.6	100.0	100.0	100.0	95.8	100.0	97.7
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	23.4	0.0	0.0	0.0	4.2	0.0	2.3
<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	0.0	0.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	23.4	0.0	0.0	0.0	4.2	0.0	2.3
<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. 2008 Summary of Operation



## 5. Historical Summary

**Date of Construction Start:** 16 Aug 1972  
**Date of First Criticality:** 09 Aug 1977  
**Date of Grid Connection:** 18 Aug 1977  
**Date of Commercial Operation:** 01 Dec 1977

**Lifetime Generation:** 183083.5 GW(e).h  
**Cumulative Energy Availability Factor:** 83.1%  
**Cumulative Load Factor:** 81.3%  
**Cumulative Unit Capability Factor:** 83.2%  
**Cumulative Energy Unavailability Factor:** 16.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	395.9	820.0	100.0	100.0	100.0	100.0	64.2	64.2	512	68.8
1978	5919.8	829.0	81.5	83.0	81.5	83.0	81.5	80.2	7568	86.4
1979	1732.4	829.0	23.9	54.6	23.9	54.6	23.9	53.2	2502	28.6
1980	4607.8	814.0	74.4	61.0	70.2	59.6	64.4	56.8	6110	69.6
1981	2653.0	804.0	41.5	56.3	41.5	55.3	37.7	52.2	3624	41.4
1982	5233.3	804.0	79.3	60.7	79.3	59.9	74.3	56.5	6936	79.2
1983	5268.6	804.0	77.7	63.5	77.7	62.8	74.8	59.4	6832	78.0
1984	5432.7	804.0	78.5	65.6	78.5	65.0	76.9	61.9	6920	78.8
1985	5868.7	816.0	84.3	67.9	84.3	67.4	82.1	64.4	7378	84.2
1986	5738.6	827.0	82.4	69.5	82.4	69.1	79.2	66.1	7247	82.7
1987	6444.9	825.0	93.7	72.0	93.7	71.5	89.2	68.4	8201	93.6
1988	5908.2	813.0	83.8	73.0	83.8	72.6	82.7	69.7	7363	83.8
1989	6022.6	824.0	86.0	74.1	86.0	73.8	83.4	70.8	7520	85.8
1990	6908.6	824.0	99.1	76.0	99.1	75.7	95.7	72.7	8681	99.1
1991	5416.1	814.0	78.9	76.2	78.4	75.9	76.0	73.0	6870	78.4
1992	5667.9	812.0	81.0	76.6	81.0	76.2	79.5	73.4	7119	81.0
1993	6873.9	812.0	97.3	77.8	97.3	77.5	96.6	74.8	8522	97.3
1994	6059.8	812.0	86.1	78.3	86.1	78.0	85.2	75.4	7546	86.1
1995	5752.0	812.0	82.4	78.5	82.4	78.3	80.9	75.7	7220	82.4
1996	7142.3	812.0	99.5	79.6	99.5	79.4	100.1	77.0	8740	99.5
1997	5434.0	821.0	77.7	79.5	77.7	79.3	75.5	76.9	6803	77.7
1998	5237.9	822.0	74.8	79.3	74.8	79.1	72.7	76.7	6539	74.6
1999	7226.5	847.0	99.3	80.2	99.3	80.0	97.4	77.7	8695	99.3
2000	5204.1	828.0	76.8	80.1	76.8	79.9	71.6	77.4	6775	77.1
2001	6392.5	833.0	88.3	80.4	88.3	80.3	87.6	77.9	7736	88.3
2002	7221.8	833.0	98.7	81.2	98.7	81.0	99.0	78.7	8641	98.6
2003	6609.9	830.0	90.3	81.5	90.3	81.4	90.9	79.2	7909	90.3
2004	6423.9	851.0	87.0	81.7	87.0	81.6	86.8	79.5	7627	86.8
2005	7402.2	833.0	99.4	82.4	99.4	82.2	101.4	80.3	8709	99.4
2006	6419.3	851.0	86.5	82.5	86.5	82.4	86.1	80.5	7578	86.5
2007	6530.8	851.0	87.5	82.7	87.5	82.5	87.6	80.7	7663	87.5
2008	7281.5	851.0	97.7	83.2	97.7	83.1	97.4	81.3	8579	97.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					233	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	1074					
D. Inspection, maintenance or repair without refuelling	63					
E. Testing of plant systems or component:	2				0	
H. Nuclear regulatory requirement		173			7	11
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					3	5
L. Human factor related		30				
Subtotal	0	203	0	1139	257	16
Total		203			1412	

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		10
13. Reactor Auxiliary System:		1
14. Safety Systems		4
15. Reactor Cooling System:		7
16. Steam generation system:		16
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries:		107
32. Feedwater and Main Steam System		17
35. All other I&C Systems:		2
41. Main Generator System:		5
42. Electrical Power Supply System:		54
XX. Miscellaneous Systems:		1
Total	0	227

## US-364 FARLEY-2

**Operator:** ALP (ALABAMA POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 860.0 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 2008

**Net Energy Production:** 6795.5 GW(e).h  
**Energy Availability Factor:** 90.5%  
**Load Factor:** 90.0%  
**Operating Factor:** 90.6%  
**Energy Unavailability Factor:** 9.5%  
**Total Off-line Time:** 828 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	649.5	608.0	648.2	600.6	645.9	621.8	640.0	640.1	621.4	346.7	120.7	652.7	6795.5
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	59.6	26.9	98.5	90.5
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	59.6	26.9	98.6	90.5
<b>LF (%)</b>	101.5	101.6	101.3	97.0	100.9	100.4	100.0	100.0	100.3	54.2	19.5	102.0	90.0
<b>OF (%)</b>	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	59.5	26.9	100.0	90.6
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.4	73.1	1.5	9.5
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.4	73.1	0.0	9.4
<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	1.5	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	16 Aug 1972	<b>Lifetime Generation:</b>	169962.2 GW(e).h
<b>Date of First Criticality:</b>	05 May 1981	<b>Cumulative Energy Availability Factor:</b>	87.2%
<b>Date of Grid Connection:</b>	25 May 1981	<b>Cumulative Load Factor:</b>	84.8%
<b>Date of Commercial Operation:</b>	30 Jul 1981	<b>Cumulative Unit Capability Factor:</b>	87.2%
		<b>Cumulative Energy Unavailability Factor:</b>	12.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	2920.8	825.0	95.3	95.3	95.3	95.3	80.1	80.1	3665	83.0
1982	5311.3	814.0	79.4	84.8	79.4	84.8	74.5	76.4	6931	79.1
1983	5984.1	814.0	87.7	86.0	87.7	86.0	83.9	79.4	7696	87.9
1984	6618.9	814.0	94.4	88.4	94.2	88.3	92.6	83.1	8276	94.2
1985	5474.2	809.0	77.8	86.1	77.4	85.9	77.2	81.8	6813	77.8
1986	5959.9	829.0	85.2	85.9	85.2	85.8	82.1	81.9	7455	85.1
1987	4910.4	824.0	73.0	83.9	73.0	83.8	68.0	79.7	6396	73.0
1988	6550.4	823.0	100.0	86.1	100.0	86.0	90.6	81.2	8039	91.5
1989	5621.6	830.0	80.5	85.4	80.5	85.3	77.3	80.7	7037	80.3
1990	5277.0	828.0	71.8	84.0	71.8	83.9	72.8	79.9	6478	73.9
1991	6739.9	824.0	96.0	85.1	95.6	85.0	93.4	81.2	8376	95.6
1992	5409.9	824.0	79.5	84.6	79.5	84.5	74.7	80.6	6987	79.5
1993	5248.5	822.0	75.8	83.9	75.8	83.8	72.9	80.0	6644	75.8
1994	7147.2	822.0	98.9	85.0	98.9	84.9	99.3	81.4	8660	98.9
1995	5091.4	822.0	79.7	84.7	79.7	84.6	70.7	80.7	6984	79.7
1996	5741.3	822.0	81.5	84.4	81.5	84.4	79.5	80.6	7160	81.5
1997	7280.9	822.0	100.0	85.4	100.0	85.3	101.1	81.8	8760	100.0
1998	6271.4	824.0	85.8	85.4	85.8	85.4	86.8	82.1	7514	85.8
1999	5356.2	852.0	82.7	85.3	82.7	85.2	71.8	81.6	7242	82.7
2000	7362.6	839.0	99.4	86.0	99.4	85.9	99.9	82.5	8736	99.5
2001	5777.7	842.0	79.0	85.7	79.0	85.6	78.3	82.3	6921	79.0
2002	6463.4	842.0	87.7	85.8	87.7	85.7	87.6	82.6	7682	87.7
2003	7379.4	839.0	99.2	86.4	99.2	86.3	100.4	83.4	8687	99.2
2004	6724.1	849.0	90.5	86.5	90.5	86.5	90.7	83.7	7949	90.5
2005	6351.7	842.0	86.4	86.5	86.4	86.5	86.1	83.8	7566	86.4
2006	7620.3	860.0	100.0	87.1	100.0	87.0	101.2	84.5	8760	100.0
2007	6572.1	860.0	87.5	87.1	87.5	87.1	87.2	84.6	7660	87.4
2008	6795.5	860.0	90.5	87.2	90.5	87.2	90.0	84.8	7956	90.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					152	
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling	826			862		
D. Inspection, maintenance or repair without refuelling				25		
E. Testing of plant systems or component:				8		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				8	4	2
L. Human factor related					2	
Subtotal	826	0	0	903	170	2
Total	826			1075		

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		18
13. Reactor Auxiliary System:		9
14. Safety Systems		20
15. Reactor Cooling System:		45
16. Steam generation system:		17
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries:		15
32. Feedwater and Main Steam System		6
35. All other I&C Systems:		1
41. Main Generator System:		5
42. Electrical Power Supply System:		1
Total	0	140

# US-333 FITZPATRICK

**Operator:** ENTERGY (ENTERGY NUCLEAR)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 852.0 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 2008

**Net Energy Production:** 6691.0 GW(e).h  
**Energy Availability Factor:** 92.3%  
**Load Factor:** 89.4%  
**Operating Factor:** 92.3%  
**Energy Unavailability Factor:** 7.7%  
**Total Off-line Time:** 679 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	611.3	596.7	635.7	523.1	599.7	604.4	585.0	606.9	250.8	422.2	618.1	637.3	6691.0
<b>EAF (%)</b>	100.0	100.0	100.0	92.1	100.0	100.0	100.0	100.0	44.0	70.6	100.0	100.0	92.3
<b>UCF (%)</b>	100.0	100.0	100.0	92.1	100.0	100.0	100.0	100.0	44.1	70.6	100.0	100.0	92.3
<b>LF (%)</b>	96.4	100.6	100.4	85.3	94.6	98.5	92.3	95.7	40.9	66.6	100.6	100.5	89.4
<b>OF (%)</b>	100.0	100.0	100.0	92.1	100.0	100.0	100.0	100.0	44.0	70.6	100.0	100.0	92.3
<b>EUF (%)</b>	0.0	0.0	0.0	7.9	0.0	0.0	0.0	0.0	56.0	29.4	0.0	0.0	7.7
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.0	29.1	0.0	0.0	7.1
<b>UCLF (%)</b>	0.0	0.0	0.0	7.9	0.0	0.0	0.0	0.0	0.0	0.2	0.0	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 20 May 1970  
**Date of First Criticality:** 17 Nov 1974  
**Date of Grid Connection:** 01 Feb 1975  
**Date of Commercial Operation:** 28 Jul 1975

**Lifetime Generation:** 172332.7 GW(e).h  
**Cumulative Energy Availability Factor:** 76.7%  
**Cumulative Load Factor:** 73.5%  
**Cumulative Unit Capability Factor:** 76.8%  
**Cumulative Energy Unavailability Factor:** 23.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	1824.1	819.0	100.0	100.0	100.0	100.0	50.3	50.3	3230	73.1
1976	4156.4	670.0	70.5	81.7	70.5	81.7	70.6	62.9	6284	71.5
1977	3893.4	770.0	57.7	71.8	57.7	71.8	57.7	60.7	5986	68.3
1978	4197.4	800.0	59.9	68.2	59.9	68.2	59.9	60.5	6311	72.0
1979	2964.7	800.0	42.3	62.2	42.3	62.2	42.3	56.3	4450	50.8
1980	4334.1	802.0	71.0	63.9	70.4	63.7	61.5	57.3	6162	70.2
1981	4779.7	810.0	74.7	65.6	74.7	65.5	67.4	58.9	6539	74.6
1982	4959.7	810.0	75.3	66.9	75.3	66.9	69.9	60.4	6570	75.0
1983	4634.3	810.0	70.7	67.4	70.7	67.3	65.3	61.0	6183	70.6
1984	4899.4	810.0	76.9	68.4	76.9	68.3	68.9	61.8	6745	76.8
1985	4166.5	810.0	64.1	68.0	64.1	67.9	58.7	61.5	5576	63.7
1986	6015.6	797.0	90.5	70.0	90.5	69.9	86.1	63.7	7931	90.5
1987	4198.3	795.0	67.1	69.7	67.1	69.7	60.3	63.4	5891	67.2
1988	4356.9	780.0	66.5	69.5	66.5	69.5	63.5	63.4	5844	66.5
1989	6155.3	757.0	90.3	70.9	90.3	70.8	92.8	65.4	7944	90.7
1990	4601.9	782.0	68.4	70.7	68.4	70.7	67.2	65.5	6045	69.0
1991	3376.8	780.0	56.0	69.8	56.0	69.8	49.4	64.5	4534	51.8
1992	0.0	780.0	0.0	65.9	0.0	65.8	0.0	60.9	0	0.0
1993	4746.5	780.0	71.6	66.2	71.6	66.1	69.5	61.3	6301	71.9
1994	4972.6	774.0	81.9	67.0	81.9	66.9	73.3	61.9	7224	82.5
1995	4804.0	777.0	71.6	67.2	71.6	67.2	70.5	62.3	6336	72.3
1996	5290.4	765.0	79.3	67.7	79.3	67.7	78.6	63.1	7036	80.1
1997	6624.6	799.0	96.3	69.0	94.9	68.9	94.6	64.5	8310	94.9
1998	4930.5	785.0	75.2	69.3	75.2	69.2	71.7	64.8	6613	75.5
1999	6567.4	799.0	93.5	70.3	93.5	70.2	93.7	66.0	8205	93.7
2000	6024.8	813.0	86.6	71.0	86.6	70.9	84.4	66.8	7617	86.7
2001	7090.5	813.0	98.6	72.0	98.6	72.0	99.6	68.0	8639	98.6
2002	6595.0	813.0	92.4	72.8	92.4	72.7	92.6	69.0	8112	92.6
2003	6966.0	813.0	96.2	73.6	96.2	73.6	97.8	70.0	8435	96.3
2004	6455.9	813.0	90.8	74.2	90.8	74.2	90.4	70.7	7984	90.9
2005	7052.3	825.0	95.9	75.0	95.9	74.9	97.6	71.6	8403	95.9
2006	6758.7	852.0	92.6	75.6	92.6	75.5	90.6	72.3	8108	92.6
2007	6918.4	852.0	97.8	76.3	95.0	76.2	92.7	72.9	8318	95.0
2008	6691.0	852.0	92.3	76.8	92.3	76.7	89.4	73.5	8105	92.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		58			410	
B. Refuelling without a maintenance outage					55	
C. Inspection, maintenance or repair combined with refuelling	618			1121		
D. Inspection, maintenance or repair without refuelling				235		
E. Testing of plant systems or component	1			2	1	
H. Nuclear regulatory requirement					10	125
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				4	22	3
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						7
Subtotal	619	58	0	1362	498	137
Total		677			1997	

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		16
13. Reactor Auxiliary Systems		8
14. Safety Systems		83
15. Reactor Cooling Systems		54
17. Safety I&C Systems (excluding reactor I&C)	1	
31. Turbine and auxiliaries		64
32. Feedwater and Main Steam System	56	39
35. All other I&C Systems		6
41. Main Generator Systems		22
42. Electrical Power Supply Systems		48
XX. Miscellaneous Systems		19
Total	57	361



# 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**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 3517.2 GW(e).h  
**Energy Availability Factor:** 81.9%  
**Load Factor:** 83.1%  
**Operating Factor:** 81.9%  
**Energy Unavailability Factor:** 18.1%  
**Total Off-line Time:** 1589 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	377.6	352.6	257.5	220.2	0.0	123.5	360.7	348.8	357.7	374.7	365.2	378.7	3517.2
<b>EAF (%)</b>	100.0	100.0	75.3	63.0	0.0	45.4	100.0	100.0	100.0	100.0	100.0	100.0	81.9
<b>UCF (%)</b>	100.0	100.0	75.3	63.0	0.0	45.4	100.0	100.0	100.0	100.0	100.0	100.0	81.9
<b>LF (%)</b>	105.3	105.1	71.9	63.4	0.0	35.6	100.6	97.3	103.1	104.5	105.1	105.6	83.1
<b>OF (%)</b>	100.0	100.0	75.2	62.9	0.0	45.3	100.0	100.0	100.0	100.0	100.0	100.0	81.9
<b>EUF (%)</b>	0.0	0.0	24.7	37.0	100.0	54.6	0.0	0.0	0.0	0.0	0.0	0.0	18.1
<b>PUF (%)</b>	0.0	0.0	0.0	37.0	100.0	54.6	0.0	0.0	0.0	0.0	0.0	0.0	16.0
<b>UCLF (%)</b>	0.0	0.0	24.7	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 07 Jun 1968  
**Date of First Criticality:** 06 Aug 1973  
**Date of Grid Connection:** 25 Aug 1973  
**Date of Commercial Operation:** 26 Sep 1973

**Lifetime Generation:** 110550.1 GW(e).h  
**Cumulative Energy Availability Factor:** 80.2%  
**Cumulative Load Factor:** 75.5%  
**Cumulative Unit Capability Factor:** 80.2%  
**Cumulative Energy Unavailability Factor:** 19.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	601.4	468.0	96.2	96.2	96.2	96.2	44.9	44.9	2642	90.2
1974	2416.3	457.0	83.5	86.7	83.5	86.7	60.4	56.5	7304	83.4
1975	2080.8	457.0	52.0	71.8	52.0	71.8	52.0	54.6	5905	67.4
1976	2195.5	443.0	56.5	67.3	56.5	67.3	56.4	55.1	6101	69.5
1977	2922.7	444.0	75.1	69.1	75.1	69.1	75.1	59.7	6958	79.4
1978	2849.4	456.0	71.4	69.5	71.4	69.5	71.3	61.9	6580	75.1
1979	3666.1	457.0	91.6	73.0	91.6	73.0	91.6	66.6	8382	95.7
1980	2010.3	465.0	59.7	71.2	59.7	71.2	49.2	64.2	5307	60.4
1981	2149.7	480.0	72.7	71.4	72.7	71.4	51.1	62.5	6327	72.2
1982	3482.1	478.0	89.8	73.4	89.8	73.4	83.2	64.8	7856	89.7
1983	2749.9	461.0	73.1	73.4	73.1	73.4	68.1	65.1	6404	73.1
1984	2331.8	478.0	60.1	72.2	60.1	72.2	55.5	64.3	5262	59.9
1985	3066.3	478.0	73.7	72.3	73.7	72.3	73.2	65.0	6454	73.7
1986	3605.6	478.0	94.3	74.0	94.3	74.0	86.1	66.6	8263	94.3
1987	3060.6	478.0	74.7	74.0	74.7	74.0	73.1	67.1	6531	74.6
1988	2627.4	478.0	74.0	74.0	74.0	74.0	62.6	66.8	6496	74.0
1989	3296.0	478.0	87.8	74.9	87.8	74.9	78.7	67.5	7589	86.6
1990	2417.2	478.0	62.1	74.1	62.1	74.1	57.7	67.0	5420	61.9
1991	3249.0	478.0	92.9	75.2	92.9	75.2	77.6	67.6	7946	90.7
1992	2537.1	478.0	64.9	74.6	64.9	74.6	60.4	67.2	5683	64.7
1993	3102.2	478.0	80.0	74.9	80.0	74.9	74.1	67.5	6996	79.9
1994	4118.7	478.0	99.5	76.1	99.5	76.1	98.4	69.0	8711	99.4
1995	3365.6	478.0	82.4	76.4	82.4	76.4	80.4	69.5	7204	82.2
1996	3128.7	478.0	78.5	76.5	78.5	76.5	74.5	69.7	6886	78.4
1997	3818.2	478.0	92.9	77.2	92.9	77.2	91.2	70.6	8131	92.8
1998	3396.6	478.0	82.2	77.4	82.2	77.4	81.1	71.1	7195	82.1
1999	3584.4	478.0	88.9	77.8	88.9	77.8	85.6	71.6	7785	88.9
2000	3898.1	478.0	93.2	78.4	93.2	78.4	92.8	72.4	8185	93.2
2001	3524.1	478.0	88.0	78.7	88.0	78.7	84.2	72.8	7702	87.9
2002	3808.5	478.0	92.1	79.2	92.1	79.2	91.0	73.4	8061	92.0
2003	3510.1	478.0	86.8	79.4	86.8	79.4	83.8	73.8	7596	86.7
2004	4071.3	478.0	96.8	80.0	96.8	80.0	97.0	74.5	8503	96.8
2005	2919.6	476.0	71.7	79.7	71.7	79.7	70.0	74.4	6277	71.6
2006	3100.5	478.0	74.8	79.6	74.8	79.6	74.0	74.4	6553	74.8
2007	4370.3	482.0	100.0	80.2	100.0	80.2	103.5	75.3	8760	100.0
2008	3517.2	482.0	81.9	80.2	81.9	80.2	83.1	75.5	7195	81.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1973 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		183			170	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1403			1258		
D. Inspection, maintenance or repair without refuelling				75	13	
E. Testing of plant systems or component				27		
G. Major back-fitting, refurbishment or upgrading activities without refuelling						0
H. Nuclear regulatory requirement						4
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				5	15	0
Subtotal	1403	183	0	1365	199	4
Total		1586			1568	

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

System	2008 Hours Lost	1973 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		11
13. Reactor Auxiliary System:		6
14. Safety Systems		14
15. Reactor Cooling System:		55
16. Steam generation system:		4
31. Turbine and auxiliaries	183	16
32. Feedwater and Main Steam System		15
42. Electrical Power Supply System:		37
XX. Miscellaneous Systems		6
Total	183	164

# US-416 GRAND GULF-1

Operator: ENTERGY (ENTERGY NUCLEAR)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 1268.0 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 2008

Net Energy Production: 9417.1 GW(e).h

Energy Availability Factor: 87.0%

Load Factor: 84.5%

Operating Factor: 86.9%

Energy Unavailability Factor: 13.0%

Total Off-line Time: 1147 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	794.7	711.4	813.6	904.5	944.4	905.0	938.3	928.0	620.1	24.4	880.5	952.2	9417.1
EAF (%)	88.3	84.0	91.6	100.0	100.0	100.0	100.0	100.0	69.4	10.9	100.0	100.0	87.0
UCF (%)	88.3	84.0	91.6	100.0	100.0	100.0	100.0	100.0	69.4	10.9	100.0	100.0	87.0
LF (%)	84.2	80.6	86.4	99.1	100.1	99.1	99.5	98.4	67.9	2.6	96.3	100.9	84.5
OF (%)	88.2	83.9	91.5	100.0	100.0	100.0	100.0	100.0	69.4	10.8	100.0	100.0	86.9
EUF (%)	11.7	16.0	8.4	0.0	0.0	0.0	0.0	0.0	30.6	89.1	0.0	0.0	13.0
PUF (%)	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	30.6	71.7	0.0	0.0	9.9
UCLF (%)	11.7	0.0	8.4	0.0	0.0	0.0	0.0	0.0	0.0	17.4	0.0	0.0	3.2
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 04 Sep 1974      Lifetime Generation: 212898.8 GW(e).h

Date of First Criticality: 18 Aug 1982      Cumulative Energy Availability Factor: 86.5%

Date of Grid Connection: 20 Oct 1984      Cumulative Load Factor: 86.5%

Date of Commercial Operation: 01 Jul 1985      Cumulative Unit Capability Factor: 86.7%

   Cumulative Energy Unavailability Factor: 13.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	2654.1	1108.0	58.7	58.7	58.7	58.7	54.2	54.2	2691	60.9
1986	4098.1	1108.0	60.5	59.9	60.5	59.9	42.2	46.2	5326	60.8
1987	7727.0	1130.0	80.9	68.4	80.9	68.4	78.0	59.1	7098	81.0
1988	9591.0	1142.0	93.8	75.8	93.8	75.8	95.6	69.7	8250	93.9
1989	7846.3	1142.0	76.9	76.0	76.9	76.0	78.4	71.7	6815	77.8
1990	7404.0	1142.0	76.6	76.1	76.6	76.1	74.0	72.1	6765	77.2
1991	9118.7	1142.0	89.6	78.2	88.4	78.0	91.1	75.0	8035	91.7
1992	8171.1	1143.0	81.1	78.6	81.1	78.4	81.4	75.9	7163	81.5
1993	7898.5	1143.0	77.6	78.5	77.6	78.3	78.9	76.2	6845	78.1
1994	9614.8	1143.0	94.5	80.2	94.5	80.1	96.0	78.3	8284	94.6
1995	7809.7	1153.0	77.7	79.9	77.7	79.8	77.3	78.2	6829	78.0
1996	9224.7	1175.0	87.7	80.6	87.7	80.5	89.3	79.2	7696	87.6
1997	10817.6	1200.0	100.0	82.3	100.0	82.2	102.9	81.2	8760	100.0
1998	9190.8	1200.0	87.5	82.7	87.5	82.6	87.4	81.7	7641	87.2
1999	8428.4	1204.0	79.3	82.4	79.3	82.3	79.9	81.6	6944	79.3
2000	10694.6	1208.0	99.2	83.6	98.3	83.4	100.7	82.9	8634	98.3
2001	9924.0	1210.0	92.3	84.1	91.8	83.9	93.6	83.5	8040	91.8
2002	10059.5	1207.0	93.8	84.7	92.9	84.5	95.1	84.2	8139	92.9
2003	10902.5	1207.0	97.9	85.4	97.9	85.2	103.1	85.3	8574	97.9
2004	10235.1	1207.0	91.2	85.7	91.2	85.5	96.5	85.9	8047	91.6
2005	10077.8	1263.0	91.7	86.0	91.1	85.8	91.1	86.2	7974	91.0
2006	10807.3	1266.0	97.8	86.6	97.8	86.4	97.4	86.7	8570	97.8
2007	9358.8	1268.0	87.3	86.7	87.3	86.5	84.3	86.6	7643	87.2
2008	9417.1	1268.0	87.0	86.7	87.0	86.5	84.5	86.5	7637	86.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		279			219	
B. Refuelling without a maintenance outage					29	
C. Inspection, maintenance or repair combined with refuelling	753			667	19	
D. Inspection, maintenance or repair without refuelling	111			116	2	
E. Testing of plant systems or component				0	0	
H. Nuclear regulatory requirement					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					34	12
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					5	2
Subtotal	864	279	0	783	309	14
Total		1143			1106	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		5
13. Reactor Auxiliary Systems		24
14. Safety Systems		2
15. Reactor Cooling Systems	43	38
17. Safety I&C Systems (excluding reactor I&C)		12
31. Turbine and auxiliaries	86	30
32. Feedwater and Main Steam System		17
33. Circulating Water System		2
35. All other I&C Systems		5
41. Main Generator Systems	62	12
42. Electrical Power Supply Systems	87	37
XX. Miscellaneous Systems		26
Total	278	210

## US-261 H.B. ROBINSON-2

**Operator:** PROGRESS (Progress Energy Corporation)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 710.0 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 2008

**Net Energy Production:** 5429.3 GW(e).h  
**Energy Availability Factor:** 84.0%  
**Load Factor:** 87.1%  
**Operating Factor:** 84.0%  
**Energy Unavailability Factor:** 16.0%  
**Total Off-line Time:** 1404 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	564.5	528.1	552.7	541.2	554.2	524.8	538.9	536.3	423.1	0.0	141.2	524.5	5429.3
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.4	0.0	30.8	94.6	84.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.4	0.0	30.8	94.6	84.0
<b>LF (%)</b>	106.9	106.9	104.8	105.9	104.9	102.7	102.0	101.5	82.8	0.0	27.6	99.3	87.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.3	0.0	30.8	94.5	84.0
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.6	100.0	69.2	5.4	16.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.6	100.0	23.4	3.0	12.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.8	2.4	4.0
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 13 Apr 1967  
**Date of First Criticality:** 20 Sep 1970  
**Date of Grid Connection:** 26 Sep 1970  
**Date of Commercial Operation:** 07 Mar 1971

**Lifetime Generation:** 171994.4 GW(e).h  
**Cumulative Energy Availability Factor:** 78.5%  
**Cumulative Load Factor:** 75.8%  
**Cumulative Unit Capability Factor:** 78.7%  
**Cumulative Energy Unavailability Factor:** 21.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1971	2337.3	739.0	100.0	100.0	100.0	100.0	43.1	43.1	3534	48.1
1972	5082.4	739.0	100.0	100.0	100.0	100.0	78.3	62.3	7487	85.2
1973	3765.5	715.0	75.7	91.6	75.7	91.6	60.1	61.5	6591	75.2
1974	4813.1	700.0	83.3	89.5	83.3	89.5	78.5	65.8	7297	83.3
1975	4170.9	665.0	71.0	86.0	71.0	86.0	71.6	66.9	6316	72.1
1976	4874.2	667.0	82.5	85.4	82.5	85.4	83.2	69.6	7435	84.6
1977	4130.2	665.0	70.8	83.4	70.8	83.4	70.9	69.8	7462	85.2
1978	3980.0	665.0	68.2	81.5	68.2	81.5	68.3	69.6	6307	72.0
1979	4005.1	665.0	68.7	80.1	68.7	80.1	68.8	69.5	6172	70.5
1980	3210.9	665.0	61.9	78.3	61.9	78.3	55.0	68.1	5464	62.2
1981	3510.8	665.0	81.1	78.6	73.4	77.9	60.3	67.4	6391	73.0
1982	2268.4	665.0	47.9	76.0	47.9	75.4	38.9	65.0	4278	48.8
1983	3347.5	665.0	75.5	76.0	75.5	75.4	57.5	64.5	6609	75.4
1984	224.3	665.0	7.0	71.1	7.0	70.6	3.8	60.2	615	7.0
1985	5239.9	665.0	87.6	72.2	87.6	71.7	89.9	62.1	7697	87.9
1986	4799.6	665.0	79.7	72.7	79.7	72.2	82.4	63.4	7028	80.2
1987	4235.5	665.0	70.3	72.5	70.3	72.1	72.7	63.9	6224	71.1
1988	3182.4	665.0	64.2	72.1	64.2	71.7	54.5	63.4	5717	65.1
1989	2790.5	665.0	45.5	70.7	45.5	70.3	47.9	62.6	4107	46.9
1990	3319.2	665.0	63.1	70.3	63.1	69.9	57.0	62.3	5614	64.1
1991	4792.2	672.0	80.2	70.8	80.2	70.4	81.3	63.2	7048	80.5
1992	4062.9	683.0	66.2	70.6	66.2	70.2	67.7	63.4	5812	66.2
1993	4193.3	683.0	70.1	70.6	70.1	70.2	70.1	63.7	6137	70.1
1994	4655.1	683.0	78.2	70.9	78.2	70.6	77.8	64.3	6845	78.1
1995	5033.8	683.0	84.0	71.4	84.0	71.1	84.1	65.1	7356	84.0
1996	5460.1	683.0	88.2	72.1	88.2	71.8	91.0	66.1	7745	88.2
1997	6197.6	683.0	98.9	73.1	98.9	72.8	103.6	67.5	8662	98.9
1998	5505.6	683.0	88.5	73.6	88.5	73.4	92.0	68.4	7751	88.5
1999	5684.5	683.0	91.4	74.3	91.4	74.0	95.0	69.4	8009	91.4
2000	6237.1	683.0	99.6	75.1	99.6	74.9	104.0	70.5	8750	99.6
2001	5515.0	683.0	90.4	75.6	90.4	75.4	92.2	71.2	7919	90.4
2002	5606.1	683.0	90.9	76.1	90.9	75.9	93.7	71.9	7960	90.9
2003	6439.9	710.0	100.0	76.9	100.0	76.6	103.5	72.9	8760	100.0
2004	5742.2	710.0	88.9	77.2	88.9	77.0	92.1	73.5	7811	88.9
2005	5770.1	710.0	89.5	77.6	89.5	77.4	92.8	74.1	7839	89.5
2006	6442.7	710.0	99.4	78.2	99.4	78.0	103.6	75.0	8705	99.4
2007	5737.9	710.0	89.3	78.5	89.3	78.3	92.3	75.5	7825	89.3
2008	5429.3	710.0	84.0	78.7	84.0	78.5	87.1	75.8	7380	84.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		348			506	
B. Refuelling without a maintenance outage					59	
C. Inspection, maintenance or repair combined with refuelling	1032			1154		
D. Inspection, maintenance or repair without refuelling	22			40		
E. Testing of plant systems or component				0	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirement					107	16
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					36	0
Subtotal	1054	348	0	1195	708	16
Total		1402			1919	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		37
13. Reactor Auxiliary System		2
14. Safety Systems		36
15. Reactor Cooling System		62
16. Steam generation system		117
31. Turbine and auxiliaries	348	90
32. Feedwater and Main Steam System		38
35. All other I&C Systems		0
41. Main Generator System		0
42. Electrical Power Supply System		82
XX. Miscellaneous Systems		13
Total	348	477



# US-321 HATCH-1

**Operator:** SOUTH (Southern Nuclear Operating Co.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6433.7 GW(e).h  
**Energy Availability Factor:** 85.7%  
**Load Factor:** 83.6%  
**Operating Factor:** 85.7%  
**Energy Unavailability Factor:** 14.3%  
**Total Off-line Time:** 1257 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	653.6	46.4	145.5	628.0	655.6	623.4	550.9	654.0	599.6	655.0	558.0	663.7	6433.7
<b>EAF (%)</b>	100.0	10.3	37.8	100.0	100.0	100.0	88.9	100.0	97.2	100.0	90.8	100.0	85.7
<b>UCF (%)</b>	100.0	10.4	37.8	100.0	100.0	100.0	88.9	100.0	97.2	100.0	90.8	100.0	85.7
<b>LF (%)</b>	100.3	7.6	22.4	99.6	100.6	98.8	84.5	100.3	95.1	100.5	88.3	101.8	83.6
<b>OF (%)</b>	100.0	10.3	37.8	100.0	100.0	100.0	88.8	100.0	97.1	100.0	90.7	100.0	85.7
<b>EUF (%)</b>	0.0	89.7	62.2	0.0	0.0	0.0	11.1	0.0	2.8	0.0	9.2	0.0	14.3
<b>PUF (%)</b>	0.0	89.7	62.2	0.0	0.0	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	11.1	0.0	2.8	0.0	9.2	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 30 Sep 1969  
**Date of First Criticality:** 12 Sep 1974  
**Date of Grid Connection:** 11 Nov 1974  
**Date of Commercial Operation:** 31 Dec 1975

**Lifetime Generation:** 179233.0 GW(e).h  
**Cumulative Energy Availability Factor:** 79.9%  
**Cumulative Load Factor:** 77.3%  
**Cumulative Unit Capability Factor:** 80.0%  
**Cumulative Energy Unavailability Factor:** 20.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	38.3	786.0	100.0	100.0	100.0	100.0	6.5	6.5	134	18.0
1976	4133.8	786.0	60.0	63.1	60.0	63.1	59.9	55.7	7299	83.1
1977	3716.7	700.0	60.2	61.8	60.2	61.8	60.6	57.9	5802	66.2
1978	4277.2	717.0	68.1	63.8	68.1	63.8	68.1	61.1	6370	72.7
1979	3349.5	739.0	51.7	60.8	51.7	60.8	51.7	58.8	4781	54.6
1980	4790.2	764.0	82.3	65.2	82.1	65.1	71.4	61.4	7174	81.7
1981	2770.7	757.0	50.6	62.7	50.6	62.7	41.8	58.1	4384	50.0
1982	2893.9	758.0	49.4	60.8	49.4	60.8	43.6	56.0	4313	49.2
1983	3968.9	764.0	71.5	62.2	71.5	62.2	59.3	56.4	6240	71.2
1984	3609.2	752.0	62.5	62.2	62.3	62.2	54.6	56.2	5473	62.3
1985	4761.4	752.0	76.5	63.6	76.5	63.6	72.3	57.8	6694	76.4
1986	3645.4	768.0	59.0	63.2	59.0	63.2	54.2	57.5	5162	58.9
1987	5080.7	750.0	80.4	64.6	80.4	64.6	77.3	59.1	7043	80.4
1988	4115.8	756.0	66.0	64.7	66.0	64.7	62.0	59.4	5802	66.1
1989	6479.7	757.0	100.0	67.3	100.0	67.2	97.7	62.1	8760	100.0
1990	4103.4	753.0	65.1	67.1	65.1	67.1	62.2	62.1	5722	65.3
1991	4707.5	741.0	74.6	67.6	74.0	67.5	72.5	62.7	6530	74.5
1992	6157.2	741.0	96.1	69.2	96.1	69.2	94.6	64.6	8444	96.1
1993	4956.7	737.0	78.4	69.7	78.4	69.7	76.8	65.2	6913	78.9
1994	5512.2	741.0	85.8	70.6	85.8	70.5	84.9	66.3	7542	86.1
1995	6465.8	741.0	100.0	72.0	100.0	71.9	99.6	67.9	8760	100.0
1996	5726.7	788.0	87.8	72.8	87.8	72.7	82.6	68.6	7666	87.3
1997	6009.0	800.0	87.9	73.5	87.9	73.5	85.7	69.5	7637	87.2
1998	6951.8	800.0	99.9	74.7	99.9	74.7	99.2	70.8	8751	99.9
1999	5968.8	808.0	82.2	75.1	82.2	75.0	84.3	71.4	7153	81.7
2000	6413.4	860.0	86.2	75.6	86.2	75.5	84.8	72.0	7530	85.7
2001	7496.2	863.0	99.1	76.6	99.1	76.5	99.2	73.2	8689	99.2
2002	6627.1	856.0	88.8	77.1	88.8	77.0	88.4	73.8	7778	88.8
2003	7146.9	856.0	96.3	77.8	96.3	77.8	95.3	74.7	8438	96.3
2004	6896.1	869.0	91.7	78.4	91.7	78.3	90.8	75.3	8046	91.6
2005	6993.5	856.0	92.7	78.9	92.7	78.9	93.3	75.9	8121	92.7
2006	6422.8	849.0	85.4	79.1	85.4	79.1	86.3	76.3	7516	85.8
2007	7499.1	876.0	97.6	79.8	97.6	79.7	97.7	77.1	8550	97.6
2008	6433.7	876.0	85.7	80.0	85.7	79.9	83.6	77.3	7527	85.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		168			361	0
B. Refuelling without a maintenance outage					20	
C. Inspection, maintenance or repair combined with refuelling	1085			1112		
D. Inspection, maintenance or repair without refuelling				102	0	
E. Testing of plant systems or component				0	3	
H. Nuclear regulatory requirement						0
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				3	49	
P. Fire					12	
Subtotal	1085	168	0	1217	445	1
Total		1253			1663	

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		20
13. Reactor Auxiliary Systems		45
14. Safety Systems		34
15. Reactor Cooling Systems		49
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	82	66
32. Feedwater and Main Steam System		65
33. Circulating Water System		1
35. All other I&C Systems		8
41. Main Generator Systems	20	29
42. Electrical Power Supply Systems	66	17
XX. Miscellaneous Systems		9
Total	168	346

## US-366 HATCH-2

**Operator:** SOUTH (Southern Nuclear Operating Co.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 7479.8 GW(e).h  
**Energy Availability Factor:** 97.0%  
**Load Factor:** 96.4%  
**Operating Factor:** 96.9%  
**Energy Unavailability Factor:** 3.0%  
**Total Off-line Time:** 268 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	668.4	625.0	574.4	641.4	452.2	629.5	654.7	652.8	625.9	653.8	644.3	657.4	7479.8
<b>EAF (%)</b>	100.0	100.0	90.7	100.0	73.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.0
<b>UCF (%)</b>	100.0	100.0	90.7	100.0	73.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.0
<b>LF (%)</b>	101.7	101.7	87.5	100.9	68.8	99.0	99.7	99.4	98.4	99.5	101.2	100.1	96.4
<b>OF (%)</b>	100.0	100.0	90.6	100.0	73.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.9
<b>EUF (%)</b>	0.0	0.0	9.3	0.0	26.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	26.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2
<b>UCLF (%)</b>	0.0	0.0	9.3	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	27 Dec 1972	<b>Lifetime Generation:</b>	165292.4 GW(e).h
<b>Date of First Criticality:</b>	04 Jul 1978	<b>Cumulative Energy Availability Factor:</b>	82.6%
<b>Date of Grid Connection:</b>	22 Sep 1978	<b>Cumulative Load Factor:</b>	78.9%
<b>Date of Commercial Operation:</b>	05 Sep 1979	<b>Cumulative Unit Capability Factor:</b>	82.6%
		<b>Cumulative Energy Unavailability Factor:</b>	17.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1979	1757.0	749.0	100.0	100.0	100.0	100.0	80.1	80.1	2480	84.7
1980	3653.1	767.0	61.0	70.6	59.1	69.2	54.2	60.6	5269	60.0
1981	4481.5	772.0	78.7	74.1	78.7	73.3	66.3	63.0	6872	78.4
1982	3734.2	771.0	63.9	71.0	63.9	70.5	55.3	60.7	5588	63.8
1983	3817.2	771.0	66.1	69.9	66.1	69.5	56.5	59.7	5774	65.9
1984	1893.5	748.0	26.7	62.0	26.7	61.6	28.8	54.1	2833	32.3
1985	5376.1	748.0	82.6	65.2	82.6	64.9	82.0	58.4	7239	82.6
1986	3618.7	777.0	70.4	65.9	70.4	65.6	53.2	57.7	6169	70.4
1987	5755.6	761.0	95.7	69.4	95.7	69.2	86.3	61.1	8388	95.8
1988	4254.5	768.0	65.7	69.0	65.7	68.8	63.1	61.3	5917	67.4
1989	4147.2	768.0	68.6	69.0	68.6	68.8	61.6	61.3	6155	70.3
1990	6527.8	766.0	98.7	71.6	98.7	71.5	97.3	64.5	8649	98.7
1991	4932.2	761.0	74.4	71.8	74.4	71.7	74.0	65.3	6656	76.0
1992	4692.4	764.0	74.5	72.0	74.5	71.9	69.9	65.6	6668	75.9
1993	4999.7	757.0	87.4	73.1	87.4	73.0	75.4	66.3	7734	88.3
1994	5275.6	765.0	85.2	73.9	85.2	73.8	78.7	67.1	7534	86.0
1995	5055.5	768.0	77.4	74.1	77.4	74.0	75.1	67.6	6888	78.6
1996	7021.7	809.0	98.4	75.6	98.4	75.5	98.8	69.5	8639	98.3
1997	6033.6	818.0	86.4	76.2	86.4	76.1	84.2	70.4	7560	86.3
1998	5829.9	821.0	82.8	76.6	82.8	76.5	81.0	70.9	7247	82.7
1999	7073.6	855.0	93.3	77.5	93.3	77.4	94.4	72.2	8173	93.3
2000	6900.3	873.0	89.6	78.1	89.6	78.0	89.9	73.1	7884	89.8
2001	6584.5	878.0	86.3	78.5	86.3	78.5	85.6	73.8	7618	87.0
2002	7423.3	870.0	97.3	79.4	97.3	79.3	97.4	74.9	8544	97.5
2003	6962.5	883.0	91.9	80.0	91.9	79.9	91.1	75.6	8052	91.9
2004	7520.6	883.0	97.8	80.8	97.8	80.7	97.0	76.6	8589	97.8
2005	6727.8	883.0	88.2	81.1	88.2	81.0	87.0	77.0	7724	88.2
2006	7641.8	883.0	99.3	81.8	99.3	81.7	98.8	77.9	8694	99.2
2007	6749.0	883.0	88.4	82.1	88.4	82.0	87.3	78.2	7744	88.4
2008	7479.8	883.0	97.0	82.6	97.0	82.6	96.4	78.9	8516	96.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		69			222	
B. Refuelling without a maintenance outage					42	
C. Inspection, maintenance or repair combined with refuelling				1044		
D. Inspection, maintenance or repair without refuelling	197			125	2	
E. Testing of plant systems or component				10	86	
H. Nuclear regulatory requirement				2		5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	40	
Subtotal	197	69	0	1181	392	5
Total		266			1578	

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		5
12. Reactor I&C Systems	69	15
14. Safety Systems		5
15. Reactor Cooling System		52
21. Fuel Handling and Storage Facilities		26
31. Turbine and auxiliaries		29
32. Feedwater and Main Steam System		39
33. Circulating Water System		1
41. Main Generator System		27
42. Electrical Power Supply System		13
Total	69	212

# US-354 HOPE CREEK-1

Operator: PSEG (PUBLIC SERVICE ELECTRIC &amp; GAS CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 1061.0 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 2008

Net Energy Production: 10006.3 GW(e).h

Energy Availability Factor: 99.7%

Load Factor: 100.4%

Operating Factor: 99.7%

Energy Unavailability Factor: 0.3%

Total Off-line Time: 28 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	759.8	745.2	800.4	771.0	799.7	832.6	862.7	874.0	860.0	904.9	872.1	923.8	10006.3
EAF (%)	95.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7
UCF (%)	95.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7
LF (%)	96.3	100.9	101.5	100.9	101.3	97.5	97.8	99.1	100.7	102.6	102.0	104.7	100.4
OF (%)	96.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7
EUF (%)	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
PUF (%)	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Mar 1976      Lifetime Generation: 167472.0 GW(e).h

Date of First Criticality: 28 Jun 1986      Cumulative Energy Availability Factor: 85.4%

Date of Grid Connection: 01 Aug 1986      Cumulative Load Factor: 83.1%

Date of Commercial Operation: 20 Dec 1986      Cumulative Unit Capability Factor: 85.4%

   Cumulative Energy Unavailability Factor: 14.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	Data not provided									
1987	7308.7	1067.0	92.7	92.7	92.7	92.7	78.2	78.2	7457	85.1
1988	6470.9	1061.0	79.0	85.9	79.0	85.9	69.4	73.8	6369	72.5
1989	6614.3	1031.0	76.7	82.9	76.7	82.9	73.2	73.6	6717	76.7
1990	8100.1	1031.0	90.7	84.8	90.7	84.8	89.7	77.6	7940	90.6
1991	7402.7	1031.0	83.1	84.5	83.1	84.5	82.0	78.4	7280	83.1
1992	7059.1	1031.0	78.9	83.5	78.9	83.5	77.9	78.4	6930	78.9
1993	8825.3	1031.0	97.4	85.5	97.4	85.5	97.7	81.1	8526	97.3
1994	7125.6	1031.0	79.6	84.8	79.6	84.8	78.9	80.8	6969	79.6
1995	7072.3	1031.0	79.2	84.2	79.2	84.2	78.3	80.5	6937	79.2
1996	6770.7	1031.0	75.4	83.3	75.4	83.3	74.8	80.0	6618	75.3
1997	6417.8	1031.0	74.3	82.5	74.3	82.5	71.1	79.2	6511	74.3
1998	8700.4	1031.0	97.5	83.7	97.5	83.7	96.3	80.6	8539	97.5
1999	7701.1	1031.0	86.1	83.9	86.1	83.9	85.3	80.9	7538	86.1
2000	7271.7	1031.0	82.6	83.8	82.6	83.8	80.3	80.9	7259	82.6
2001	8065.3	1049.0	89.8	84.2	89.8	84.2	88.7	81.4	7859	89.7
2002	8843.1	1049.0	97.7	85.0	97.7	85.0	96.2	82.4	8555	97.7
2003	7260.6	1049.0	81.5	84.8	81.5	84.8	79.0	82.2	7137	81.5
2004	6048.9	1049.0	69.7	84.0	69.7	84.0	65.6	81.2	6123	69.7
2005	7684.8	1049.0	84.2	84.0	84.2	84.0	83.6	81.4	7379	84.2
2006	8617.8	1059.0	91.8	84.4	91.8	84.4	92.9	81.9	8042	91.8
2007	8104.5	1061.0	88.8	84.6	88.8	84.6	87.2	82.2	7774	88.7
2008	10006.3	1186.0	99.7	85.4	99.7	85.4	100.4	83.1	8756	99.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					265	
B. Refuelling without a maintenance					17	
C. Inspection, maintenance or repair combined with refuelling				874		
D. Inspection, maintenance or repair without refuelling	27			121		
E. Testing of plant systems or component:				0	5	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					6	
L. Human factor related					1	
Subtotal	27	0	0	995	294	0
Total	27			1289		

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		10
13. Reactor Auxiliary System:		33
15. Reactor Cooling System:		41
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		55
32. Feedwater and Main Steam System		37
33. Circulating Water System		2
41. Main Generator System:		23
42. Electrical Power Supply System:		34
Total	0	250



## US-247 INDIAN POINT-2

**Operator:** ENTERGY (ENTERGY NUCLEAR)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 8205.2 GW(e).h  
**Energy Availability Factor:** 92.1%  
**Load Factor:** 91.6%  
**Operating Factor:** 92.1%  
**Energy Unavailability Factor:** 7.9%  
**Total Off-line Time:** 696 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	767.3	718.1	558.2	195.8	765.0	711.6	747.1	747.2	728.2	759.8	740.9	765.9	8205.2
<b>EAF (%)</b>	100.0	100.0	73.9	32.1	100.0	98.2	100.0	100.0	100.0	100.0	100.0	100.0	92.1
<b>UCF (%)</b>	100.0	100.0	73.9	32.1	100.0	98.2	100.0	100.0	100.0	100.0	100.0	100.0	92.1
<b>LF (%)</b>	101.1	101.2	73.7	26.7	100.8	96.9	98.4	98.5	99.2	100.1	100.7	100.9	91.6
<b>OF (%)</b>	100.0	100.0	73.9	32.1	100.0	98.2	100.0	100.0	100.0	100.0	100.0	100.0	92.1
<b>EUF (%)</b>	0.0	0.0	26.1	67.9	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	7.9
<b>PUF (%)</b>	0.0	0.0	19.4	63.5	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	7.0
<b>UCLF (%)</b>	0.0	0.0	6.7	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 14 Oct 1966  
**Date of First Criticality:** 22 May 1973  
**Date of Grid Connection:** 26 Jun 1973  
**Date of Commercial Operation:** 01 Aug 1974

**Lifetime Generation:** 194225.4 GW(e).h  
**Cumulative Energy Availability Factor:** 71.9%  
**Cumulative Load Factor:** 70.1%  
**Cumulative Unit Capability Factor:** 71.9%  
**Cumulative Energy Unavailability Factor:** 28.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	2037.0	873.0	79.8	79.8	79.8	79.8	63.5	63.5	2933	79.9
1975	4646.0	865.0	61.3	66.8	61.3	66.8	61.3	62.0	6545	74.7
1976	2287.1	864.0	30.2	51.7	30.2	51.7	30.1	48.8	3054	34.8
1977	5210.3	864.0	68.9	56.7	68.9	56.7	68.8	54.7	6626	75.6
1978	4372.9	859.0	58.2	57.0	58.2	57.0	58.1	55.4	5503	62.8
1979	4808.4	856.0	64.1	58.3	64.1	58.3	64.1	57.0	6156	70.3
1980	4273.2	856.0	66.8	59.6	63.9	59.2	56.8	57.0	5689	64.8
1981	3065.0	856.0	44.9	57.7	44.9	57.3	40.9	54.8	4027	46.0
1982	4458.6	862.0	65.0	58.5	65.0	58.2	59.0	55.3	5726	65.4
1983	5895.3	859.0	83.5	61.2	83.5	60.9	78.3	57.8	7354	83.9
1984	2891.6	864.0	48.4	59.9	48.4	59.7	38.1	55.9	4552	51.8
1985	6665.0	855.0	95.5	63.0	95.5	62.8	89.0	58.8	8382	95.7
1986	3827.4	855.0	52.6	62.2	52.6	62.0	51.1	58.1	4924	56.2
1987	5149.6	852.0	69.8	62.8	69.8	62.5	68.9	58.9	6331	72.3
1988	6064.0	856.0	81.0	64.0	81.0	63.8	80.6	60.4	7247	82.5
1989	4476.9	856.0	60.4	63.8	60.4	63.6	59.7	60.4	5556	63.4
1990	5222.1	886.0	64.3	63.8	64.3	63.6	67.2	60.8	5779	66.0
1991	3873.4	929.0	51.2	63.0	51.2	62.9	47.6	60.0	4495	51.3
1992	7880.6	939.0	96.7	65.0	96.7	64.9	95.5	62.1	8494	96.7
1993	5931.7	941.0	75.3	65.6	75.3	65.4	72.0	62.6	6570	75.0
1994	7634.6	941.0	100.0	67.4	100.0	67.3	92.6	64.2	8760	100.0
1995	4896.9	941.0	63.6	67.2	63.6	67.1	59.4	64.0	5533	63.2
1996	7831.8	941.0	94.2	68.5	94.2	68.4	94.7	65.4	8261	94.0
1997	3179.7	936.0	41.7	67.3	41.7	67.2	38.8	64.2	3639	41.5
1998	2512.5	932.0	30.9	65.7	30.9	65.6	30.8	62.8	2698	30.8
1999	7300.4	937.0	87.6	66.6	87.6	66.5	88.9	63.9	7665	87.5
2000	1062.3	941.0	12.5	64.5	12.5	64.4	12.9	61.8	1099	12.5
2001	7792.7	951.0	96.2	65.7	96.2	65.6	94.5	63.1	8429	96.2
2002	7556.6	951.0	90.2	66.6	90.2	66.5	91.7	64.1	7931	90.5
2003	8370.8	956.0	98.1	67.7	98.1	67.6	100.3	65.5	8597	98.1
2004	7513.1	956.0	89.3	68.5	89.3	68.4	89.5	66.3	7851	89.4
2005	8847.1	965.0	99.7	69.6	99.7	69.5	104.6	67.6	8730	99.6
2006	7984.7	1020.0	90.6	70.3	90.6	70.2	89.4	68.4	7937	90.6
2007	8842.6	1020.0	99.1	71.3	99.1	71.2	99.0	69.4	8679	99.1
2008	8205.2	1020.0	92.1	71.9	92.1	71.9	91.6	70.1	8088	92.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1973 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		81			974	
B. Refuelling without a maintenance outage					8	
C. Inspection, maintenance or repair combined with refuelling	601			1055		
D. Inspection, maintenance or repair without refuelling	12			193		
E. Testing of plant systems or component				24		
H. Nuclear regulatory requirement				4	1	
J. Grid limitation, failure or grid unavailability						6
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				84	13	0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					1	
Subtotal	613	81	0	1360	997	6
Total		694			2363	

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

System	2008 Hours Lost	1973 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		51
13. Reactor Auxiliary System:		8
14. Safety Systems		9
15. Reactor Cooling System:		62
16. Steam generation system:	18	80
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		61
32. Feedwater and Main Steam System	49	338
35. All other I&C Systems		2
41. Main Generator System:	12	45
42. Electrical Power Supply System:		228
XX. Miscellaneous Systems		0
Total	79	888

## US-286 INDIAN POINT-3

**Operator:** ENTERGY (ENTERGY NUCLEAR)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1025.0 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 2008

**Net Energy Production:** 9162.7 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 101.8%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	780.3	729.9	779.3	755.1	779.1	751.1	769.8	770.5	749.1	777.8	740.9	779.9	9162.7
<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>	102.3	102.3	102.3	102.3	102.2	101.8	100.9	101.0	101.5	102.0	100.3	102.3	101.8
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	13 Aug 1969	<b>Lifetime Generation:</b>	179297.8 GW(e).h
<b>Date of First Criticality:</b>	06 Apr 1976	<b>Cumulative Energy Availability Factor:</b>	68.2%
<b>Date of Grid Connection:</b>	27 Apr 1976	<b>Cumulative Load Factor:</b>	65.3%
<b>Date of Commercial Operation:</b>	30 Aug 1976	<b>Cumulative Unit Capability Factor:</b>	68.2%
		<b>Cumulative Energy Unavailability Factor:</b>	31.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976	2257.5	899.0	100.0	100.0	100.0	100.0	70.4	70.4	2871	78.2
1977	5520.8	873.0	72.1	80.3	72.1	80.3	72.2	71.7	6556	74.8
1978	5457.6	911.0	68.3	75.3	68.3	75.3	68.4	70.3	6365	72.7
1979	4794.6	965.0	56.7	69.5	56.7	69.5	56.7	66.1	5824	66.5
1980	3070.4	965.0	53.6	65.7	53.6	65.7	36.2	59.0	4667	53.1
1981	3033.4	965.0	59.4	64.5	59.4	64.5	35.9	54.6	5236	59.8
1982	1436.1	891.0	22.5	58.2	22.5	58.2	18.4	49.2	1967	22.5
1983	60.7	934.0	2.4	50.6	2.4	50.6	0.7	42.6	229	2.6
1984	6041.7	965.0	76.2	53.8	76.2	53.8	71.3	46.1	6703	76.3
1985	4728.5	965.0	65.5	55.1	65.5	55.1	55.9	47.2	5782	66.0
1986	5525.6	959.0	72.9	56.8	72.9	56.8	65.8	49.0	6431	73.4
1987	4850.6	950.0	60.5	57.2	60.5	57.2	58.3	49.8	5396	61.6
1988	6711.9	965.0	81.9	59.2	81.9	59.2	79.2	52.3	7217	82.2
1989	4968.7	965.0	59.7	59.2	59.7	59.2	58.8	52.8	5279	60.3
1990	5031.8	965.0	60.8	59.4	60.8	59.4	59.5	53.2	5374	61.3
1991	7300.8	965.0	88.8	61.3	88.8	61.3	86.4	55.4	7577	86.5
1992	4760.6	965.0	59.2	61.2	59.2	61.2	56.2	55.5	5248	59.7
1993	1192.6	965.0	13.4	58.4	13.4	58.4	14.1	53.1	1292	14.7
1994	0.0	965.0	0.0	55.2	0.0	55.2	0.0	50.1	0	0.0
1995	1471.5	965.0	18.2	53.2	18.2	53.2	17.4	48.4	1696	19.4
1996	5872.5	965.0	72.4	54.2	72.4	54.2	69.3	49.5	6390	72.7
1997	4337.3	965.0	57.4	54.3	57.4	54.3	51.3	49.5	4650	53.1
1998	7656.5	965.0	93.6	56.1	93.6	56.1	90.6	51.4	8197	93.6
1999	7269.2	965.0	87.4	57.5	87.4	57.5	86.0	52.9	7659	87.4
2000	8432.2	965.0	97.9	59.1	97.9	59.1	99.5	54.8	8600	97.9
2001	7940.2	965.0	92.8	60.5	92.8	60.5	93.9	56.4	8130	92.8
2002	8432.6	979.0	98.3	61.9	98.3	61.9	99.6	58.1	8611	98.3
2003	7608.4	979.0	88.4	62.9	88.4	62.9	88.7	59.2	7748	88.4
2004	8747.3	979.0	100.0	64.3	100.0	64.3	101.7	60.7	8784	100.0
2005	8037.2	985.0	91.0	65.2	91.0	65.2	93.1	61.9	7969	91.0
2006	8974.5	1025.0	99.4	66.4	99.4	66.4	100.0	63.2	8705	99.4
2007	7797.3	1025.0	86.8	67.1	86.8	67.1	86.8	64.0	7602	86.8
2008	9162.7	1025.0	100.0	68.2	100.0	68.2	101.8	65.3	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					1304	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling				1111		
D. Inspection, maintenance or repair without refuelling				262	1	
E. Testing of plant systems or component:				2	10	
J. Grid limitation, failure or grid unavailability					5	0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					13	
P. Fire					0	
Subtotal	0	0	0	1375	1337	0
Total	0			2712		

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		19
13. Reactor Auxiliary System:		9
14. Safety Systems		620
15. Reactor Cooling System:		37
16. Steam generation system:		74
17. Safety I&C Systems (excluding reactor I&C)		0
31. Turbine and auxiliaries		107
32. Feedwater and Main Steam System		54
33. Circulating Water System		0
41. Main Generator System:		318
42. Electrical Power Supply System:		50
XX. Miscellaneous Systems		3
Total	0	1291

## US-305 KEWAUNEE

**Operator:** DOMENGY (DOMINION ENERGY KEWAUNEE)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 556.0 MW(e)  
**Design Net Capacity:** 535.0 MW(e)  
**Design Discharge Burnup:** 38900 MW.d/t  
**Status at end of year:** Operational

### 2. Production Summary 2008

**Net Energy Production:** 4387.3 GW(e).h  
**Energy Availability Factor:** 88.6%  
**Load Factor:** 89.8%  
**Operating Factor:** 88.6%  
**Energy Unavailability Factor:** 11.4%  
**Total Off-line Time:** 1002 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	423.6	397.9	379.1	0.0	283.8	410.7	424.5	398.9	408.8	423.0	412.2	424.8	4387.3
<b>EAF (%)</b>	100.0	100.0	90.3	0.0	71.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.6
<b>UCF (%)</b>	100.0	100.0	90.3	0.0	71.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.6
<b>LF (%)</b>	102.4	102.8	91.8	0.0	68.6	102.6	102.6	96.4	102.1	102.2	102.8	102.7	89.8
<b>OF (%)</b>	100.0	100.0	90.3	0.0	71.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	88.6
<b>EUF (%)</b>	0.0	0.0	9.7	100.0	28.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4
<b>PUF (%)</b>	0.0	0.0	9.7	100.0	28.2	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	0.0	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 06 Aug 1968  
**Date of First Criticality:** 07 Mar 1974  
**Date of Grid Connection:** 08 Apr 1974  
**Date of Commercial Operation:** 16 Jun 1974

**Lifetime Generation:** 129733.9 GW(e).h  
**Cumulative Energy Availability Factor:** 82.9%  
**Cumulative Load Factor:** 82.5%  
**Cumulative Unit Capability Factor:** 82.9%  
**Cumulative Energy Unavailability Factor:** 17.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	1719.7	531.0	76.4	76.4	76.4	76.4	62.6	62.6	3918	76.3
1975	3340.1	535.0	71.3	73.2	71.3	73.2	71.3	68.1	7730	88.2
1976	3382.5	522.0	73.7	73.4	73.7	73.4	73.8	70.2	6924	78.8
1977	3546.6	522.0	77.4	74.5	77.4	74.5	77.6	72.3	6985	79.7
1978	3890.6	519.0	85.6	76.9	85.6	76.9	85.6	75.1	7835	89.4
1979	3439.2	520.0	75.5	76.6	75.5	76.6	75.5	75.2	6921	79.0
1980	3631.2	522.0	82.3	77.5	82.3	77.5	79.2	75.8	7207	82.0
1981	3769.2	516.0	86.6	78.7	86.6	78.7	83.4	76.8	7596	86.7
1982	3824.9	514.0	87.4	79.7	87.4	79.7	84.9	77.7	7669	87.5
1983	3706.9	510.0	83.7	80.1	83.7	80.1	83.0	78.3	7334	83.7
1984	3810.0	503.0	85.3	80.6	85.3	80.6	86.2	79.0	7527	85.7
1985	3699.2	503.0	81.8	80.7	81.8	80.7	84.0	79.4	7213	82.3
1986	3854.7	503.0	85.3	81.0	85.3	81.0	87.5	80.0	7514	85.8
1987	4008.6	503.0	88.8	81.6	88.8	81.6	91.0	80.8	7809	89.1
1988	3914.8	503.0	87.1	82.0	87.1	82.0	88.6	81.3	7679	87.4
1989	3741.8	503.0	83.9	82.1	83.9	82.1	84.9	81.6	7390	84.4
1990	3900.8	503.0	87.2	82.4	87.2	82.4	88.5	82.0	7668	87.5
1991	3674.8	507.0	80.3	82.3	80.3	82.3	82.7	82.0	7247	82.7
1992	3938.1	511.0	87.3	82.5	87.3	82.5	87.7	82.3	7682	87.5
1993	3816.9	511.0	86.0	82.7	86.0	82.7	85.3	82.5	7548	86.2
1994	3961.5	511.0	88.2	83.0	88.2	83.0	88.5	82.8	7738	88.3
1995	3793.4	511.0	87.1	83.2	87.1	83.2	84.7	82.9	7645	87.3
1996	3171.1	511.0	71.3	82.6	71.3	82.6	70.6	82.3	6299	71.7
1997	2363.8	511.0	55.5	81.5	55.5	81.5	52.8	81.1	4866	55.5
1998	3705.4	511.0	86.6	81.7	86.6	81.7	82.8	81.1	7584	86.6
1999	4424.7	511.0	100.0	82.4	100.0	82.4	98.8	81.8	8760	100.0
2000	3799.9	511.0	88.5	82.6	88.5	82.6	84.7	81.9	7760	88.3
2001	3461.7	511.0	80.1	82.5	80.1	82.5	77.3	81.8	7009	80.0
2002	4468.7	511.0	97.3	83.1	97.3	83.1	99.8	82.4	8514	97.2
2003	4159.1	526.0	90.5	83.3	90.5	83.3	91.6	82.7	7893	90.1
2004	3873.9	556.0	80.4	83.2	80.4	83.2	80.4	82.6	7049	80.2
2005	3043.1	539.0	62.3	82.5	62.3	82.5	64.4	82.0	5451	62.2
2006	3673.8	556.0	76.0	82.3	76.0	82.3	75.4	81.8	6653	75.9
2007	4625.8	556.0	94.1	82.7	94.1	82.7	95.0	82.2	8238	94.0
2008	4387.3	556.0	88.6	82.9	88.6	82.9	89.8	82.5	7782	88.6



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					243	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	1001			1035		
D. Inspection, maintenance or repair without refuelling				74		
E. Testing of plant systems or component				2		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				2		
H. Nuclear regulatory requirement					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	1
L. Human factor related					9	
Subtotal	1001	0	0	1113	256	1
Total	1001			1370		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		12
12. Reactor I&C Systems		8
14. Safety Systems		101
15. Reactor Cooling System		13
16. Steam generation system		3
31. Turbine and auxiliaries		27
32. Feedwater and Main Steam System		26
33. Circulating Water System		7
35. All other I&C Systems		1
41. Main Generator System		3
42. Electrical Power Supply System		17
XX. Miscellaneous Systems		19
Total	0	237

# US-373 LASALLE-1

**Operator:** EXELON (Exelon Generation)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1118.0 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 2008

**Net Energy Production:** 8883.8 GW(e).h  
**Energy Availability Factor:** 92.3%  
**Load Factor:** 90.5%  
**Operating Factor:** 92.2%  
**Energy Unavailability Factor:** 7.7%  
**Total Off-line Time:** 681 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	623.3	57.8	804.9	829.5	851.9	817.1	835.0	836.1	755.3	783.0	832.5	857.4	8883.8
<b>EAF (%)</b>	100.0	15.3	100.0	100.0	100.0	100.0	100.0	100.0	93.4	94.2	100.0	100.0	92.3
<b>UCF (%)</b>	100.0	15.3	100.0	100.0	100.0	100.0	100.0	100.0	93.4	94.2	100.0	100.0	92.3
<b>LF (%)</b>	74.9	7.4	96.9	103.1	102.4	101.5	100.4	100.5	93.8	94.1	103.3	103.1	90.5
<b>OF (%)</b>	100.0	15.2	100.0	100.0	100.0	100.0	100.0	100.0	93.3	94.2	100.0	100.0	92.2
<b>EUF (%)</b>	0.0	84.7	0.0	0.0	0.0	0.0	0.0	0.0	6.6	5.8	0.0	0.0	7.7
<b>PUF (%)</b>	0.0	84.7	0.0	0.0	0.0	0.0	0.0	0.0	6.6	5.8	0.0	0.0	7.7
<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	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 10 Sep 1973  
**Date of First Criticality:** 21 Jun 1982  
**Date of Grid Connection:** 04 Sep 1982  
**Date of Commercial Operation:** 01 Jan 1984

**Lifetime Generation:** 171735.1 GW(e).h  
**Cumulative Energy Availability Factor:** 75.1%  
**Cumulative Load Factor:** 72.6%  
**Cumulative Unit Capability Factor:** 75.1%  
**Cumulative Energy Unavailability Factor:** 24.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	5206.2	1078.0	69.4	69.4	69.4	69.4	55.0	55.0	6052	68.9
1985	4827.5	1036.0	64.3	66.9	63.7	66.6	53.2	54.1	5581	63.7
1986	2100.8	1036.0	25.8	53.4	25.8	53.2	23.1	43.9	2331	26.6
1987	4108.1	1036.0	61.9	55.5	61.9	55.3	45.3	44.3	5455	62.3
1988	5453.7	1036.0	65.9	57.6	65.9	57.4	59.9	47.4	5818	66.2
1989	6180.6	1036.0	69.7	59.6	69.7	59.5	68.1	50.8	6103	69.7
1990	8637.4	1036.0	95.0	64.6	95.0	64.5	95.2	57.1	8329	95.1
1991	6841.4	1036.0	75.4	65.9	75.4	65.9	75.4	59.4	6627	75.7
1992	6469.3	1036.0	74.0	66.8	74.0	66.8	71.1	60.7	6528	74.3
1993	7207.5	1036.0	81.0	68.2	81.0	68.2	79.4	62.5	7102	81.1
1994	4945.3	1036.0	57.8	67.3	57.8	67.2	54.5	61.8	5095	58.2
1995	8239.6	1036.0	93.9	69.5	93.9	69.5	90.8	64.2	8226	93.9
1996	3300.4	1036.0	37.5	67.0	37.5	67.0	36.3	62.1	3349	38.1
1997	0.0	1036.0	0.0	62.3	0.0	62.2	0.0	57.7	0	0.0
1998	3336.7	1036.0	36.3	60.5	36.3	60.5	36.8	56.3	3174	36.2
1999	8013.7	1036.0	90.8	62.4	90.8	62.4	88.3	58.3	7963	90.9
2000	9745.4	1078.0	100.0	64.7	100.0	64.7	102.8	61.0	8784	100.0
2001	9850.4	1111.0	99.4	66.8	99.4	66.7	101.0	63.3	8708	99.4
2002	8927.6	1111.0	90.6	68.1	90.6	68.1	91.7	64.9	7945	90.7
2003	9739.0	1111.0	99.5	69.8	99.5	69.7	100.1	66.8	8716	99.5
2004	9051.5	1111.0	91.5	70.9	91.5	70.8	92.8	68.1	8059	91.7
2005	9812.0	1146.0	100.0	72.3	100.0	72.3	97.7	69.5	8760	100.0
2006	9092.1	1118.0	92.8	73.2	92.8	73.2	92.8	70.6	8129	92.8
2007	9664.6	1118.0	100.0	74.4	100.0	74.4	98.7	71.8	8760	100.0
2008	8883.8	1118.0	92.3	75.1	92.3	75.1	90.5	72.6	8103	92.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					454	
B. Refuelling without a maintenance outage					37	
C. Inspection, maintenance or repair combined with refuelling	589			1054		
D. Inspection, maintenance or repair without refuelling	90			431		
E. Testing of plant systems or component				62	0	
H. Nuclear regulatory requirement					206	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					16	
Subtotal	679	0	0	1547	713	1
Total	679			2261		

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		34
12. Reactor I&C Systems		25
13. Reactor Auxiliary System:		5
14. Safety Systems		46
15. Reactor Cooling System:		130
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		110
32. Feedwater and Main Steam System		18
33. Circulating Water System		9
35. All other I&C Systems		4
41. Main Generator System:		14
42. Electrical Power Supply System:		35
Total	0	431

## US-374 LASALLE-2

**Operator:** EXELON (Exelon Generation)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1120.0 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 2008

**Net Energy Production:** 9964.6 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. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	858.1	804.2	850.1	827.7	841.7	815.4	833.4	828.4	793.0	850.0	829.9	832.6	9964.6
<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>	103.0	103.2	102.2	102.6	101.0	101.1	100.0	99.4	98.3	102.0	102.8	99.9	101.3
<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. 2008 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 10 Sep 1973  
**Date of First Criticality:** 10 Mar 1984  
**Date of Grid Connection:** 20 Apr 1984  
**Date of Commercial Operation:** 19 Oct 1984

**Lifetime Generation:** 166444.9 GW(e).h  
**Cumulative Energy Availability Factor:** 74.3%  
**Cumulative Load Factor:** 73.1%  
**Cumulative Unit Capability Factor:** 74.3%  
**Cumulative Energy Unavailability Factor:** 25.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	1392.1	1039.0	86.4	86.4	86.4	86.4	75.7	75.7	1536	86.5
1985	3477.0	1036.0	41.8	49.3	41.8	49.3	38.3	44.6	3698	42.2
1986	5727.8	1036.0	75.0	61.0	74.6	60.8	63.1	53.0	6533	74.6
1987	4573.3	1036.0	53.1	58.5	53.1	58.4	50.4	52.2	4699	53.6
1988	5662.8	1036.0	75.1	62.5	75.1	62.4	62.2	54.6	6593	75.1
1989	6506.8	1036.0	75.1	64.9	75.1	64.8	71.7	57.9	6591	75.2
1990	6216.8	1036.0	70.0	65.7	70.0	65.7	68.5	59.6	6162	70.3
1991	8712.4	1036.0	95.3	69.8	95.3	69.8	96.0	64.6	8357	95.4
1992	5797.9	1036.0	66.3	69.4	66.3	69.4	63.7	64.5	5850	66.6
1993	5859.2	1036.0	66.1	69.0	66.1	69.0	64.6	64.5	5825	66.5
1994	8428.9	1036.0	92.4	71.3	92.4	71.3	92.9	67.3	8101	92.5
1995	5905.7	1036.0	66.5	70.9	66.5	70.9	65.1	67.1	5855	66.8
1996	5642.3	1036.0	64.5	70.4	64.5	70.3	62.0	66.7	5649	64.3
1997	0.0	1036.0	0.0	65.1	0.0	65.0	0.0	61.6	0	0.0
1998	0.0	1036.0	0.0	60.5	0.0	60.4	0.0	57.3	0	0.0
1999	6632.3	1036.0	71.1	61.2	71.1	61.1	73.1	58.3	6231	71.1
2000	9040.4	1072.0	93.1	63.2	93.1	63.2	96.0	60.7	8229	93.7
2001	9683.4	1111.0	97.2	65.3	97.2	65.3	99.3	63.1	8515	97.2
2002	8995.6	1111.0	92.1	66.9	92.1	66.9	92.4	64.8	8078	92.2
2003	8709.1	1111.0	88.4	68.1	88.4	68.0	89.5	66.2	7762	88.6
2004	9940.4	1111.0	99.8	69.7	99.8	69.7	101.9	68.1	8764	99.8
2005	8901.2	1147.0	89.7	70.7	89.7	70.7	88.6	69.1	7857	89.7
2006	10015.7	1120.0	100.0	72.1	100.0	72.1	102.1	70.7	8760	100.0
2007	9315.5	1120.0	94.6	73.2	94.6	73.1	94.9	71.8	8287	94.6
2008	9964.6	1120.0	100.0	74.3	100.0	74.3	101.3	73.1	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					276	
B. Refuelling without a maintenance outage					8	
C. Inspection, maintenance or repair combined with refuelling	1223					
D. Inspection, maintenance or repair without refuelling	186					
E. Testing of plant systems or component	1					
H. Nuclear regulatory requirement					446	
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)	48				22	
Subtotal	0	0	0	1458	752	1
Total	0			2211		

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		67
12. Reactor I&C Systems		66
15. Reactor Cooling System		18
31. Turbine and auxiliaries		30
32. Feedwater and Main Steam System		5
35. All other I&C Systems		12
41. Main Generator System		0
42. Electrical Power Supply System		25
XX. Miscellaneous Systems		16
Total	0	239

# US-352 LIMERICK-1

**Operator:** EXELON (Exelon Generation)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 9342.5 GW(e).h  
**Energy Availability Factor:** 93.9%  
**Load Factor:** 93.8%  
**Operating Factor:** 93.9%  
**Energy Unavailability Factor:** 6.1%  
**Total Off-line Time:** 533 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	847.1	731.1	204.3	831.3	853.9	812.7	836.7	842.7	815.3	859.4	838.9	869.1	9342.5
<b>EAF (%)</b>	100.0	99.9	28.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.9
<b>UCF (%)</b>	100.0	99.9	28.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.9
<b>LF (%)</b>	100.4	92.6	24.3	101.8	101.2	99.5	99.2	99.9	99.9	101.9	102.6	103.0	93.8
<b>OF (%)</b>	100.0	99.9	28.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.9
<b>EUF (%)</b>	0.0	0.1	71.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1
<b>PUF (%)</b>	0.0	0.1	64.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5
<b>UCLF (%)</b>	0.0	0.0	7.0	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 19 Jun 1974  
**Date of First Criticality:** 22 Dec 1984  
**Date of Grid Connection:** 13 Apr 1985  
**Date of Commercial Operation:** 01 Feb 1986

**Lifetime Generation:** 191540.4 GW(e).h  
**Cumulative Energy Availability Factor:** 89.5%  
**Cumulative Load Factor:** 86.3%  
**Cumulative Unit Capability Factor:** 89.5%  
**Cumulative Energy Unavailability Factor:** 10.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	6848.9	1055.0	82.8	82.8	82.8	82.8	81.0	81.0	6634	82.8
1987	5341.3	1055.0	67.7	74.9	67.7	74.9	57.8	68.9	5924	67.6
1988	6674.8	1055.0	96.4	82.3	96.4	82.3	72.0	70.0	8470	96.4
1989	5244.3	1055.0	69.4	79.0	69.4	79.0	56.7	66.6	5638	64.4
1990	5633.1	1055.0	65.3	76.2	65.3	76.2	61.0	65.4	5724	65.3
1991	8133.8	1055.0	91.8	78.9	91.8	78.9	88.0	69.3	8043	91.8
1992	6239.6	1055.0	69.6	77.5	69.6	77.5	67.3	69.0	6115	69.6
1993	8745.5	1055.0	98.5	80.2	98.5	80.2	94.6	72.2	8626	98.5
1994	7858.0	1055.0	89.5	81.2	89.5	81.2	85.0	73.7	7840	89.5
1995	8147.5	1055.0	91.1	82.2	91.1	82.2	88.2	75.1	7973	91.0
1996	8141.6	1096.0	88.8	82.8	88.8	82.8	84.5	76.0	7758	88.3
1997	9227.5	1105.0	97.5	84.1	97.5	84.1	95.3	77.7	8534	97.4
1998	7449.1	1112.0	81.6	83.9	81.6	83.9	76.4	77.6	7061	80.6
1999	9744.0	1134.0	98.0	85.0	98.0	85.0	98.1	79.1	8588	98.0
2000	8988.1	1139.0	90.9	85.4	90.9	85.4	89.8	79.9	7982	90.9
2001	10133.1	1143.0	99.7	86.4	99.7	86.4	101.2	81.3	8735	99.7
2002	9286.8	1134.0	94.1	86.8	94.1	86.8	93.5	82.1	8244	94.1
2003	10057.5	1134.0	99.0	87.5	99.0	87.5	101.2	83.2	8672	99.0
2004	9539.1	1134.0	95.0	88.0	95.0	88.0	95.8	83.9	8345	95.0
2005	9926.9	1134.0	98.7	88.5	98.7	88.5	99.9	84.7	8642	98.6
2006	9320.4	1134.0	93.9	88.8	93.9	88.8	93.8	85.2	8224	93.9
2007	9994.4	1134.0	99.8	89.3	99.8	89.3	100.6	85.9	8744	99.8
2008	9342.5	1134.0	93.9	89.5	93.9	89.5	93.8	86.3	8251	93.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		52			159	
C. Inspection, maintenance or repair combined with refuelling	480			691		
D. Inspection, maintenance or repair without refuelling				137	0	
E. Testing of plant systems or component:				23	2	
H. Nuclear regulatory requirement				103		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				109	37	
Subtotal	480	52	0	1063	198	0
Total		532			1261	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		4
13. Reactor Auxiliary System:		8
14. Safety Systems		13
15. Reactor Cooling System:		34
21. Fuel Handling and Storage Facilities		7
31. Turbine and auxiliaries:		46
32. Feedwater and Main Steam System	52	9
41. Main Generator System:		4
42. Electrical Power Supply System:		17
XX. Miscellaneous Systems		12
Total	52	154

## US-353 LIMERICK-2

**Operator:** EXELON (Exelon Generation)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 9712.1 GW(e).h  
**Energy Availability Factor:** 97.0%  
**Load Factor:** 97.5%  
**Operating Factor:** 97.0%  
**Energy Unavailability Factor:** 3.0%  
**Total Off-line Time:** 267 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	870.0	463.6	865.9	821.8	851.8	810.4	834.9	842.6	797.3	847.3	838.1	868.5	9712.1
<b>EAF (%)</b>	100.0	61.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.0
<b>UCF (%)</b>	100.0	61.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.0
<b>LF (%)</b>	103.1	58.7	102.8	100.6	101.0	99.3	99.0	99.9	97.7	100.4	102.5	102.9	97.5
<b>OF (%)</b>	100.0	61.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.0
<b>EUF (%)</b>	0.0	38.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
<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	38.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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. 2008 Summary of Operation

### 5. Historical Summary

**Date of Construction Start:** 19 Jun 1974  
**Date of First Criticality:** 12 Aug 1989  
**Date of Grid Connection:** 01 Sep 1989  
**Date of Commercial Operation:** 08 Jan 1990

**Lifetime Generation:** 168881.6 GW(e).h  
**Cumulative Energy Availability Factor:** 92.9%  
**Cumulative Load Factor:** 91.4%  
**Cumulative Unit Capability Factor:** 92.9%  
**Cumulative Energy Unavailability Factor:** 7.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1990	7232.6	1055.0	81.8	81.8	81.8	81.8	79.8	79.8	7174	83.5
1991	7146.9	1055.0	77.8	79.8	77.8	79.8	77.3	78.5	6919	79.0
1992	8489.2	1055.0	97.4	85.7	97.4	85.7	91.6	82.9	8557	97.4
1993	7468.7	1055.0	82.3	84.9	82.3	84.9	80.8	82.4	7289	83.2
1994	8571.5	1055.0	98.8	87.6	98.8	87.6	92.7	84.5	8657	98.8
1995	8401.4	1110.0	91.2	88.3	91.2	88.3	86.4	84.8	7984	91.1
1996	9001.1	1115.0	95.7	89.4	95.1	89.3	91.9	85.9	8346	95.0
1997	8307.5	1115.0	89.3	89.4	89.3	89.3	85.1	85.8	7840	89.5
1998	9257.9	1115.0	95.3	90.0	95.3	90.0	94.8	86.8	8346	95.3
1999	8561.0	1135.0	88.4	89.9	88.4	89.8	86.1	86.7	7726	88.2
2000	9940.7	1145.0	98.6	90.7	98.6	90.7	98.8	87.9	8661	98.6
2001	9243.4	1143.0	93.9	91.0	93.9	90.9	92.3	88.3	8230	93.9
2002	10009.5	1134.0	99.0	91.6	99.0	91.6	100.8	89.3	8672	99.0
2003	9387.1	1134.0	94.2	91.8	94.2	91.8	94.5	89.6	8252	94.2
2004	9952.0	1134.0	99.4	92.3	99.4	92.3	99.9	90.3	8734	99.4
2005	9124.7	1134.0	92.3	92.3	92.3	92.3	91.9	90.4	8085	92.3
2006	10015.1	1134.0	99.4	92.8	99.4	92.7	100.8	91.1	8710	99.4
2007	9059.2	1134.0	91.4	92.7	91.4	92.7	91.2	91.1	8007	91.4
2008	9712.1	1134.0	97.0	92.9	97.0	92.9	97.5	91.4	8517	97.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1990 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		266			123	
B. Refuelling without a maintenance					15	
C. Inspection, maintenance or repair combined with refuelling				377		
D. Inspection, maintenance or repair without refuelling				74		
E. Testing of plant systems or component:				0		
J. Grid limitation, failure or grid unavailability						2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					8	
Subtotal	0	266	0	451	146	2
Total		266			599	

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

System	2008 Hours Lost	1990 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:	81	
15. Reactor Cooling System:		10
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries:		63
32. Feedwater and Main Steam System		8
35. All other I&C Systems:		9
41. Main Generator System:		11
42. Electrical Power Supply System:	184	7
Total	265	112

# US-369 MCGUIRE-1

**Operator:** DUKE (DUKE POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1100.0 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 2008

**Net Energy Production:** 8364.4 GW(e).h  
**Energy Availability Factor:** 84.4%  
**Load Factor:** 86.6%  
**Operating Factor:** 84.4%  
**Energy Unavailability Factor:** 15.6%  
**Total Off-line Time:** 1372 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	857.9	805.2	856.3	826.4	849.0	700.3	823.3	827.6	507.0	0.0	449.2	862.1	8364.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	88.6	100.0	100.0	64.3	0.0	60.0	100.0	84.4
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	88.6	100.0	100.0	64.3	0.0	60.0	100.0	84.4
<b>LF (%)</b>	104.8	105.2	104.8	104.3	103.7	88.4	100.6	101.1	64.0	0.0	56.6	105.3	86.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	88.6	100.0	100.0	64.3	0.0	59.9	100.0	84.4
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	11.4	0.0	0.0	35.7	100.0	40.0	0.0	15.6
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.7	100.0	40.0	0.0	14.7
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.9
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 23 Feb 1973  
**Date of First Criticality:** 08 Aug 1981  
**Date of Grid Connection:** 12 Sep 1981  
**Date of Commercial Operation:** 01 Dec 1981

**Lifetime Generation:** 204173.1 GW(e).h  
**Cumulative Energy Availability Factor:** 79.7%  
**Cumulative Load Factor:** 76.3%  
**Cumulative Unit Capability Factor:** 80.0%  
**Cumulative Energy Unavailability Factor:** 20.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	19.1	1146.0	10.2	10.2	10.2	10.2	2.2	2.2	45	6.0
1982	4302.3	1180.0	81.6	76.0	81.6	76.0	41.6	38.5	7043	80.4
1983	4650.0	1180.0	57.3	67.0	57.3	67.0	45.0	41.6	4852	55.4
1984	6434.3	1180.0	78.1	70.6	69.3	67.8	62.1	48.3	6011	68.4
1985	6780.1	1180.0	77.1	72.2	77.1	70.1	65.6	52.5	6747	77.0
1986	5181.1	1150.0	56.2	69.1	56.2	67.4	51.4	52.3	4912	56.1
1987	7352.9	1150.0	76.7	70.3	76.7	68.9	73.0	55.6	6713	76.6
1988	7406.4	1129.0	77.0	71.3	77.0	70.0	74.7	58.3	6763	77.0
1989	7807.2	1129.0	84.5	72.9	84.5	71.7	78.9	60.7	7187	82.0
1990	4755.3	1129.0	56.9	71.1	56.9	70.2	48.1	59.4	4718	53.9
1991	6851.1	1129.0	71.4	71.2	71.4	70.3	69.3	60.3	6259	71.4
1992	7485.3	1129.0	77.9	71.8	77.9	71.0	75.5	61.7	6839	77.9
1993	5537.1	1129.0	58.2	70.7	58.2	69.9	56.0	61.2	5095	58.2
1994	6877.3	1129.0	71.9	70.8	71.9	70.1	69.5	61.8	6291	71.8
1995	8860.2	1129.0	91.6	72.2	91.6	71.6	89.6	63.8	8017	91.5
1996	8558.3	1129.0	89.5	73.3	89.5	72.7	86.3	65.3	7858	89.5
1997	7011.3	1129.0	72.7	73.3	72.7	72.7	70.9	65.6	6361	72.6
1998	8822.6	1119.0	90.0	74.3	90.0	73.7	90.0	67.0	7889	90.1
1999	8593.3	1100.0	86.6	74.9	86.6	74.4	89.2	68.2	7584	86.6
2000	9995.0	1100.0	99.5	76.2	99.5	75.7	103.4	70.0	8741	99.5
2001	8684.9	1100.0	88.0	76.7	88.0	76.3	90.1	70.9	7708	88.0
2002	9100.8	1100.0	91.8	77.4	91.8	77.0	94.4	72.0	8042	91.8
2003	9912.5	1100.0	100.0	78.4	100.0	78.0	102.9	73.4	8760	100.0
2004	8238.5	1100.0	83.4	78.6	83.4	78.2	85.3	73.9	7321	83.3
2005	8968.6	1100.0	90.9	79.1	90.9	78.7	93.1	74.7	7963	90.9
2006	9967.2	1100.0	100.0	79.9	100.0	79.6	103.4	75.8	8760	100.0
2007	7656.1	1100.0	78.2	79.9	78.2	79.5	79.5	75.9	6852	78.2
2008	8364.4	1100.0	84.4	80.0	84.4	79.7	86.6	76.3	7412	84.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		82			501	
B. Refuelling without a maintenance outage					3	
C. Inspection, maintenance or repair combined with refuelling	1289			900		
D. Inspection, maintenance or repair without refuelling				145	38	
E. Testing of plant systems or component				20		
H. Nuclear regulatory requirement					9	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				15	4	27
Subtotal	1289	82	0	1080	555	27
Total		1371			1662	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		16
13. Reactor Auxiliary System:		22
14. Safety Systems		28
15. Reactor Cooling System:	82	76
16. Steam generation system:		83
17. Safety I&C Systems (excluding reactor I&C)		1
21. Fuel Handling and Storage Facilities		33
31. Turbine and auxiliaries:		55
32. Feedwater and Main Steam System		126
41. Main Generator System:		5
42. Electrical Power Supply System:		14
XX. Miscellaneous Systems:		27
Total	82	493

# US-370 MCGUIRE-2

Operator: DUKE (DUKE POWER CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1100.0 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 2008

Net Energy Production: 8713.3 GW(e).h  
 Energy Availability Factor: 87.1%  
 Load Factor: 90.2%  
 Operating Factor: 87.1%  
 Energy Unavailability Factor: 12.9%  
 Total Off-line Time: 1133 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	862.9	807.9	0.0	325.9	858.8	820.7	838.8	835.0	814.1	852.9	832.4	864.0	8713.3
EAF (%)	100.0	100.0	0.9	44.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.1
UCF (%)	100.0	100.0	0.9	44.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.1
LF (%)	105.4	105.5	0.0	41.2	104.9	103.6	102.5	102.0	102.8	104.2	105.0	105.6	90.2
OF (%)	100.0	100.0	0.9	44.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.1
EUF (%)	0.0	0.0	99.1	55.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9
PUF (%)	0.0	0.0	99.1	55.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 23 Feb 1973      Lifetime Generation: 203166.7 GW(e).h  
 Date of First Criticality: 08 May 1983      Cumulative Energy Availability Factor: 84.0%  
 Date of Grid Connection: 23 May 1983      Cumulative Load Factor: 83.1%  
 Date of Commercial Operation: 01 Mar 1984      Cumulative Unit Capability Factor: 84.0%  
    Cumulative Energy Unavailability Factor: 16.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	6557.8	1171.0	83.0	83.0	83.0	83.0	75.7	75.7	6086	82.9
1985	5609.3	1180.0	61.0	71.0	61.0	71.0	54.3	64.0	5171	59.0
1986	6216.6	1150.0	64.5	68.8	64.5	68.8	61.7	63.2	5601	63.9
1987	7577.4	1150.0	80.2	71.7	80.2	71.7	75.2	66.3	6954	79.4
1988	8058.0	1129.0	82.3	73.9	82.3	73.9	81.3	69.3	7229	82.3
1989	7418.3	1129.0	78.4	74.6	78.4	74.6	75.0	70.3	6867	78.4
1990	6496.2	1129.0	69.5	73.9	69.5	73.9	65.7	69.6	5873	67.0
1991	9516.0	1129.0	97.6	76.9	97.6	76.9	96.2	73.0	8548	97.6
1992	6785.0	1129.0	70.0	76.1	70.0	76.1	68.4	72.5	6141	69.9
1993	6821.1	1129.0	72.8	75.8	72.8	75.8	69.0	72.1	6378	72.8
1994	8660.0	1129.0	88.0	76.9	88.0	76.9	87.6	73.5	7708	88.0
1995	9090.0	1129.0	93.0	78.2	93.0	78.2	91.9	75.1	8144	93.0
1996	7265.1	1129.0	74.6	77.9	74.6	77.9	73.3	74.9	6543	74.5
1997	6648.4	1129.0	71.0	77.4	71.0	77.4	67.2	74.4	6214	70.9
1998	9928.3	1119.0	99.5	78.9	99.5	78.9	101.3	76.1	8715	99.5
1999	8596.7	1100.0	90.5	79.6	90.5	79.6	89.2	76.9	7927	90.5
2000	8452.4	1100.0	88.3	80.1	88.3	80.1	87.5	77.6	7757	88.3
2001	9878.0	1100.0	99.3	81.2	99.3	81.2	102.5	78.9	8698	99.3
2002	8913.5	1100.0	90.7	81.7	90.7	81.7	92.5	79.6	7940	90.6
2003	9027.8	1100.0	91.6	82.1	91.6	82.1	93.7	80.3	8024	91.6
2004	9994.0	1100.0	100.0	83.0	100.0	83.0	103.4	81.4	8784	100.0
2005	8545.6	1100.0	86.7	83.1	86.7	83.1	88.7	81.7	7589	86.6
2006	8430.3	1100.0	84.7	83.2	84.7	83.2	87.5	82.0	7418	84.7
2007	9967.6	1100.0	100.0	83.9	100.0	83.9	103.4	82.8	8760	100.0
2008	8713.3	1100.0	87.1	84.0	87.1	84.0	90.2	83.1	7651	87.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				1	271	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	1034			950		
D. Inspection, maintenance or repair without refuelling	97			97	0	
E. Testing of plant systems or component:				0	0	
H. Nuclear regulatory requirement					11	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	4	
Subtotal	1131	0	0	1048	289	0
Total		1131			1337	

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		20
13. Reactor Auxiliary System:		21
14. Safety Systems		18
15. Reactor Cooling System:		76
16. Steam generation system:		15
17. Safety I&C Systems (excluding reactor I&C)		2
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		45
41. Main Generator System:		29
42. Electrical Power Supply System:		8
XX. Miscellaneous Systems		1
Total	0	245

## US-336 MILLSTONE-2

**Operator:** DOMIN (DOMINION VIRGINIA POWER)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 877.0 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 2008

**Net Energy Production:** 6619.6 GW(e).h  
**Energy Availability Factor:** 86.5%  
**Load Factor:** 85.9%  
**Operating Factor:** 86.5%  
**Energy Unavailability Factor:** 13.5%  
**Total Off-line Time:** 1188 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	655.4	612.0	653.4	101.5	182.7	579.6	629.5	650.5	628.3	648.0	630.4	648.4	6619.6
<b>EAF (%)</b>	100.0	100.0	100.0	16.7	31.4	91.6	97.9	100.0	100.0	100.0	100.0	100.0	86.5
<b>UCF (%)</b>	100.0	100.0	100.0	16.7	51.2	91.6	98.0	100.0	100.0	100.0	100.0	100.0	88.2
<b>LF (%)</b>	100.4	100.3	100.3	16.1	28.0	91.8	96.5	99.7	99.5	99.3	99.7	99.4	85.9
<b>OF (%)</b>	100.0	100.0	100.0	16.7	31.3	91.5	97.8	100.0	100.0	100.0	100.0	100.0	86.5
<b>EUF (%)</b>	0.0	0.0	0.0	83.3	68.6	8.4	2.1	0.0	0.0	0.0	0.0	0.0	13.5
<b>PUF (%)</b>	0.0	0.0	0.0	83.3	48.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	8.4	2.1	0.0	0.0	0.0	0.0	0.0	0.9
<b>XUF (%)</b>	0.0	0.0	0.0	0.0	19.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	11 Dec 1970	<b>Lifetime Generation:</b>	160360.4 GW(e).h
<b>Date of First Criticality:</b>	17 Oct 1975	<b>Cumulative Energy Availability Factor:</b>	66.0%
<b>Date of Grid Connection:</b>	09 Nov 1975	<b>Cumulative Load Factor:</b>	64.3%
<b>Date of Commercial Operation:</b>	26 Dec 1975	<b>Cumulative Unit Capability Factor:</b>	66.8%
		<b>Cumulative Energy Unavailability Factor:</b>	34.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1975	115.7	851.0	100.0	100.0	100.0	100.0	20.9	20.9	414	55.6
1976	4543.2	780.0	66.4	68.9	66.4	68.9	66.3	62.9	6815	77.6
1977	4345.7	790.0	62.9	66.0	62.9	66.0	62.8	62.9	5756	65.7
1978	4507.2	802.0	64.1	65.4	64.1	65.4	64.2	63.3	5756	65.7
1979	4370.9	837.0	59.6	63.9	59.6	63.9	59.6	62.3	5385	61.5
1980	4884.3	864.0	80.8	67.4	68.2	64.8	64.4	62.8	5947	67.7
1981	6091.7	864.0	82.7	70.1	82.7	67.9	80.5	65.8	7229	82.5
1982	5015.6	864.0	70.5	70.1	70.5	68.3	66.3	65.9	6183	70.6
1983	2474.4	861.0	34.1	65.5	34.1	63.9	32.8	61.7	2993	34.2
1984	6608.3	860.0	93.4	68.7	93.4	67.2	87.5	64.6	8209	93.5
1985	3515.6	841.0	59.4	67.8	47.7	65.3	47.7	62.9	4322	49.3
1986	5164.9	857.0	72.5	68.2	72.5	66.0	68.8	63.5	6352	72.5
1987	6892.5	857.0	93.3	70.3	93.3	68.3	91.8	65.8	8177	93.3
1988	5735.9	860.0	77.2	70.9	77.2	69.0	75.9	66.6	6810	77.5
1989	4763.6	863.0	66.9	70.6	66.9	68.8	63.0	66.4	5705	65.1
1990	5309.9	863.0	72.8	70.7	72.8	69.1	70.2	66.6	6389	72.9
1991	3948.1	863.0	55.3	69.7	55.3	68.2	52.2	65.7	4820	55.0
1992	2725.0	870.0	36.1	67.7	36.1	66.3	35.6	63.9	3187	36.3
1993	6295.9	873.0	84.8	68.7	84.8	67.3	82.3	64.9	7431	84.8
1994	3676.5	873.0	49.0	67.6	49.0	66.3	48.1	64.0	4289	49.0
1995	2740.5	873.0	37.4	66.1	37.4	64.9	35.8	62.6	3273	37.4
1996	1046.5	871.0	13.7	63.5	13.7	62.4	13.7	60.2	1222	13.9
1997	0.0	871.0	0.0	60.6	0.0	59.5	0.0	57.4	0	0.0
1998	0.0	871.0	0.0	57.9	0.0	56.9	0.0	54.9	0	0.0
1999	4433.2	870.0	60.6	58.0	60.6	57.0	58.2	55.0	5310	60.6
2000	6268.5	872.0	83.7	59.1	83.7	58.1	81.8	56.1	7353	83.7
2001	7284.0	869.0	98.0	60.6	98.0	59.7	95.4	57.7	8587	98.0
2002	6209.3	871.0	83.2	61.4	83.2	60.6	81.5	58.6	7285	83.2
2003	6109.8	866.0	80.9	62.1	80.9	61.3	80.2	59.3	7083	80.9
2004	7596.0	877.0	98.8	63.4	98.8	62.6	98.7	60.7	8677	98.8
2005	6843.0	866.0	89.2	64.3	89.2	63.5	90.2	61.7	7812	89.2
2006	6519.5	882.0	85.1	65.0	85.1	64.2	84.4	62.5	7453	85.1
2007	7686.8	877.0	100.0	66.1	100.0	65.4	100.1	63.7	8760	100.0
2008	6619.6	877.0	88.2	66.8	86.5	66.0	85.9	64.3	7596	86.5



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		75			542	
B. Refuelling without a maintenance outage					27	
C. Inspection, maintenance or repair combined with refuelling	963			1262		
D. Inspection, maintenance or repair without refuelling				48		
E. Testing of plant systems or component				9	215	
H. Nuclear regulatory requirement					607	32
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				25	6	31
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			147			
Subtotal	963	75	147	1344	1397	63
Total		1185			2804	

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		46
13. Reactor Auxiliary System:		13
14. Safety Systems		17
15. Reactor Cooling System:		123
16. Steam generation system:		93
31. Turbine and auxiliaries		69
32. Feedwater and Main Steam System	75	97
33. Circulating Water System		5
35. All other I&C Systems		1
41. Main Generator System:		2
42. Electrical Power Supply System:		57
XX. Miscellaneous Systems		0
Total	75	523

## US-423 MILLSTONE-3

Operator: DOMIN (DOMINION VIRGINIA POWER)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1145.0 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 2008

Net Energy Production: 8850.3 GW(e).h  
 Energy Availability Factor: 88.1%  
 Load Factor: 88.0%  
 Operating Factor: 88.1%  
 Energy Unavailability Factor: 11.9%  
 Total Off-line Time: 1045 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	855.1	799.3	853.9	824.2	851.9	817.9	837.5	837.3	815.6	295.2	142.1	920.2	8850.3
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	35.3	22.0	100.0	88.1
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	35.3	22.0	100.0	88.1
LF (%)	100.4	100.3	100.4	100.0	100.0	99.2	98.3	98.3	98.9	34.7	17.2	108.0	88.0
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	35.2	21.9	100.0	88.1
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.7	78.0	0.0	11.9
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.7	78.0	0.0	11.9
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. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 09 Aug 1974      Lifetime Generation: 165606.8 GW(e).h  
 Date of First Criticality: 23 Jan 1986      Cumulative Energy Availability Factor: 74.8%  
 Date of Grid Connection: 12 Feb 1986      Cumulative Load Factor: 72.7%  
 Date of Commercial Operation: 23 Apr 1986      Cumulative Unit Capability Factor: 74.8%  
    Cumulative Energy Unavailability Factor: 25.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	Data not provided									
1987	6748.2	1142.0	71.4	71.4	71.4	71.4	67.5	67.5	6235	71.2
1988	7683.6	1142.0	79.5	75.4	79.5	75.4	76.6	72.0	6954	79.2
1989	7082.6	1142.0	75.9	75.6	75.9	75.6	70.8	71.6	6636	75.8
1990	8218.2	1137.0	89.2	79.0	89.2	79.0	82.5	74.3	7798	89.0
1991	2876.7	1137.0	33.6	69.9	33.6	69.9	28.9	65.3	2850	32.5
1992	6593.8	1137.0	72.1	70.3	72.1	70.3	66.0	65.4	6311	71.8
1993	6502.8	1137.0	70.1	70.3	70.1	70.3	65.3	65.4	6106	69.7
1994	9416.2	1137.0	96.3	73.5	96.3	73.5	94.5	69.0	8426	96.2
1995	7993.6	1137.0	81.2	74.4	81.2	74.4	80.3	70.3	7083	80.9
1996	2476.7	1137.0	25.7	69.5	25.7	69.5	24.8	65.7	2156	24.5
1997	0.0	1137.0	0.0	63.2	0.0	63.2	0.0	59.8	0	0.0
1998	3392.1	1137.0	38.9	61.2	38.9	61.2	34.1	57.6	3402	38.8
1999	8307.5	1139.0	83.7	62.9	83.7	62.9	83.2	59.6	7329	83.7
2000	10125.7	1151.0	100.0	65.6	100.0	65.6	100.1	62.5	8784	100.0
2001	8169.7	1136.0	84.3	66.8	84.3	66.8	81.3	63.8	7392	84.4
2002	8746.2	1130.0	89.0	68.2	89.0	68.2	88.1	65.3	7803	89.1
2003	10005.7	1130.0	99.6	70.0	99.6	70.0	101.1	67.4	8729	99.6
2004	8983.7	1148.0	90.1	71.2	90.1	71.2	89.9	68.6	7905	90.0
2005	8767.0	1131.0	88.0	72.0	87.6	72.0	88.5	69.7	7677	87.6
2006	10111.1	1155.0	100.0	73.5	100.0	73.4	99.9	71.2	8760	100.0
2007	8699.4	1145.0	87.7	74.1	87.7	74.1	86.7	71.9	7694	87.8
2008	8850.3	1145.0	88.1	74.8	88.1	74.8	88.0	72.7	7739	88.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					585	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	1042			697		
D. Inspection, maintenance or repair without refuelling				70		
E. Testing of plant systems or component:	1			3		
H. Nuclear regulatory requirement					398	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					418	
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	1043	0	0	770	1408	1
Total	1043			2179		

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		19
13. Reactor Auxiliary System:		22
14. Safety Systems		204
15. Reactor Cooling System:		43
17. Safety I&C Systems (excluding reactor I&C)		10
31. Turbine and auxiliaries		15
32. Feedwater and Main Steam System		21
33. Circulating Water System		5
41. Main Generator System:		11
42. Electrical Power Supply System:		6
XX. Miscellaneous Systems		173
Total	0	529

# US-263 MONTICELLO

**Operator:** NORTHERN (Northern States Power Co.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 572.0 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 2008

**Net Energy Production:** 4878.0 GW(e).h  
**Energy Availability Factor:** 95.6%  
**Load Factor:** 97.1%  
**Operating Factor:** 95.6%  
**Energy Unavailability Factor:** 4.4%  
**Total Off-line Time:** 386 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	440.2	411.4	439.7	425.5	436.4	415.1	422.4	421.8	170.1	436.7	423.1	435.7	4878.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	46.5	100.0	100.0	100.0	95.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	46.5	100.0	100.0	100.0	95.6
<b>LF (%)</b>	103.4	103.3	103.5	103.3	102.5	100.8	99.2	99.1	41.3	102.6	102.6	102.4	97.1
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	46.4	100.0	100.0	100.0	95.6
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.5	0.0	0.0	0.0	4.4
<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	53.5	0.0	0.0	0.0	4.4
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 19 Jun 1967  
**Date of First Criticality:** 10 Dec 1970  
**Date of Grid Connection:** 05 Mar 1971  
**Date of Commercial Operation:** 30 Jun 1971

**Lifetime Generation:** 144899.5 GW(e).h  
**Cumulative Energy Availability Factor:** 84.6%  
**Cumulative Load Factor:** 80.0%  
**Cumulative Unit Capability Factor:** 84.7%  
**Cumulative Energy Unavailability Factor:** 15.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1971	1361.1	564.0	100.0	100.0	100.0	100.0	46.7	46.7	2850	55.5
1972	3717.9	580.0	100.0	100.0	100.0	100.0	73.0	63.4	6975	79.4
1973	3271.6	580.0	100.0	100.0	100.0	100.0	64.4	63.8	6242	71.3
1974	2925.2	538.0	75.0	93.4	75.0	93.4	62.1	63.3	6567	75.0
1975	2881.4	538.0	61.0	86.6	61.0	86.6	61.1	62.9	6322	72.2
1976	3986.2	537.0	84.3	86.2	84.3	86.2	84.5	66.6	8033	91.5
1977	3570.7	536.0	75.9	84.7	75.9	84.7	76.0	68.0	7001	79.9
1978	3856.2	536.0	81.7	84.3	81.7	84.3	82.1	69.8	7638	87.2
1979	4399.7	536.0	93.4	85.4	93.4	85.4	93.7	72.5	8549	97.6
1980	3455.5	536.0	79.0	84.7	78.2	84.6	73.4	72.6	6876	78.3
1981	3262.3	536.0	72.3	83.6	72.3	83.5	69.5	72.3	6362	72.6
1982	2425.1	525.0	62.2	81.8	62.2	81.7	52.7	70.7	5543	63.3
1983	4147.7	525.0	96.3	82.9	96.3	82.8	90.2	72.2	8438	96.3
1984	279.1	525.0	9.2	77.6	9.2	77.6	6.1	67.5	808	9.2
1985	4287.0	536.0	91.6	78.6	91.6	78.5	91.3	69.1	8028	91.6
1986	3379.9	536.0	78.8	78.6	78.8	78.5	72.0	69.3	6926	79.1
1987	3535.6	536.0	80.2	78.7	80.2	78.6	75.3	69.6	7051	80.5
1988	4573.6	536.0	99.7	79.9	99.7	79.8	97.1	71.2	8759	99.7
1989	2650.4	536.0	74.7	79.6	74.7	79.6	56.4	70.4	6578	75.1
1990	4505.9	536.0	96.0	80.4	96.0	80.4	96.0	71.7	8414	96.1
1991	3596.5	536.0	79.6	80.4	79.6	80.4	76.6	71.9	6996	79.9
1992	4453.7	536.0	97.0	81.2	97.0	81.1	94.6	73.0	8527	97.1
1993	3864.4	536.0	83.4	81.3	83.4	81.2	82.3	73.4	7322	83.6
1994	3956.2	536.0	85.6	81.4	85.6	81.4	84.3	73.8	7508	85.7
1995	4756.3	536.0	100.0	82.2	100.0	82.2	101.3	75.0	8760	100.0
1996	3872.9	541.0	84.8	82.3	84.8	82.3	81.4	75.2	7443	84.7
1997	3661.6	544.0	75.2	82.0	75.2	82.0	76.8	75.3	6609	75.4
1998	4118.9	553.0	87.7	82.2	87.7	82.2	84.9	75.6	7659	87.4
1999	4649.3	578.0	92.4	82.6	92.4	82.6	91.8	76.2	8092	92.4
2000	4251.4	578.0	83.5	82.6	83.5	82.6	83.7	76.5	7332	83.5
2001	3880.6	578.0	76.9	82.4	76.9	82.4	76.6	76.5	6774	77.3
2002	5015.6	578.0	98.4	83.0	98.4	83.0	99.1	77.3	8620	98.4
2003	4592.5	578.0	90.7	83.2	90.7	83.2	90.7	77.7	7969	91.0
2004	5034.9	578.0	98.9	83.7	98.9	83.7	99.2	78.4	8689	98.9
2005	4474.9	569.0	89.4	83.9	89.4	83.9	89.8	78.7	7826	89.3
2006	5072.6	572.0	100.0	84.4	100.0	84.3	101.2	79.4	8760	100.0
2007	4192.3	572.0	83.7	84.3	83.7	84.3	83.7	79.5	7327	83.6
2008	4878.0	572.0	95.6	84.7	95.6	84.6	97.1	80.0	8398	95.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		385			226	
B. Refuelling without a maintenance outage					5	
C. Inspection, maintenance or repair combined with refuelling	959					
D. Inspection, maintenance or repair without refuelling	113					
E. Testing of plant systems or component	0			0	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling	0			0	2	
H. Nuclear regulatory requirement						8
J. Grid limitation, failure or grid unavailability					0	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)	1			1	86	
Subtotal	0	385	0	1073	320	8
Total		385			1401	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		10
12. Reactor I&C Systems		15
13. Reactor Auxiliary System:		10
14. Safety Systems		17
15. Reactor Cooling System:		23
16. Steam generation system:		3
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		32
32. Feedwater and Main Steam System		51
33. Circulating Water System		0
35. All other I&C Systems:		5
41. Main Generator System:		13
42. Electrical Power Supply System:	385	19
XX. Miscellaneous Systems		21
Total	385	222

## US-220 NINE MILE POINT-1

**Operator:** NMPNSLLC (Nine Mile Point Nuclear Station, LLC)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 5341.4 GW(e).h  
**Energy Availability Factor:** 99.1%  
**Load Factor:** 97.9%  
**Operating Factor:** 99.1%  
**Energy Unavailability Factor:** 0.9%  
**Total Off-line Time:** 77 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	466.1	436.7	466.0	450.8	459.8	433.6	445.1	444.6	434.9	392.5	447.3	464.0	5341.4
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.8	100.0	100.0	99.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.8	100.0	100.0	99.1
<b>LF (%)</b>	100.9	101.0	101.0	100.8	99.5	97.0	96.3	96.2	97.3	85.0	99.9	100.4	97.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.7	100.0	100.0	99.1
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2	0.0	0.0	0.9
<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	10.2	0.0	0.0	0.9
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 12 Apr 1965  
**Date of First Criticality:** 05 Sep 1969  
**Date of Grid Connection:** 09 Nov 1969  
**Date of Commercial Operation:** 01 Dec 1969

**Lifetime Generation:** 141123.8 GW(e).h  
**Cumulative Energy Availability Factor:** 74.0%  
**Cumulative Load Factor:** 69.0%  
**Cumulative Unit Capability Factor:** 74.0%  
**Cumulative Energy Unavailability Factor:** 26.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1969	0.0	617.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1970	1581.0	525.0	100.0	100.0	100.0	100.0	34.4	31.3	3443	39.3
1971	3033.1	592.0	100.0	100.0	100.0	100.0	58.5	45.0	5963	68.1
1972	3344.8	630.0	100.0	100.0	100.0	100.0	60.4	50.4	6101	69.5
1973	3494.2	610.0	76.4	94.0	76.4	94.0	65.4	54.2	6682	76.3
1974	3278.7	610.0	70.5	89.3	70.5	89.3	61.4	55.7	6177	70.5
1975	3044.9	610.0	57.0	83.9	57.0	83.9	57.0	55.9	6235	71.2
1976	4112.8	610.0	76.8	82.8	76.8	82.8	76.8	58.9	7724	87.9
1977	2956.8	610.0	55.4	79.4	55.4	79.4	55.3	58.4	5171	59.0
1978	4467.4	610.0	83.6	79.9	83.6	79.9	83.6	61.3	8329	95.1
1979	3005.4	610.0	56.2	77.5	56.2	77.5	56.2	60.8	5785	66.0
1980	4537.3	610.0	92.2	78.8	92.2	78.8	84.7	62.9	8097	92.2
1981	3270.3	610.0	65.6	77.7	65.6	77.7	61.2	62.8	5780	66.0
1982	1134.8	610.0	21.5	73.4	21.5	73.4	21.2	59.6	1872	21.4
1983	2802.0	610.0	56.2	72.2	56.2	72.2	52.4	59.1	4925	56.2
1984	3635.2	610.0	71.6	72.1	71.6	72.1	67.8	59.7	6316	71.9
1985	4932.3	610.0	96.4	73.6	96.4	73.6	92.3	61.7	8441	96.4
1986	3146.9	610.0	64.9	73.1	64.9	73.1	58.9	61.5	5722	65.3
1987	4615.2	610.0	92.8	74.2	92.8	74.2	86.4	62.9	8130	92.8
1988	0.0	610.0	0.0	70.3	0.0	70.3	0.0	59.6	0	0.0
1989	0.0	610.0	0.0	66.8	0.0	66.8	0.0	56.6	0	0.0
1990	1316.7	612.0	34.2	65.2	34.2	65.2	24.6	55.1	3043	34.7
1991	3873.5	615.0	78.2	65.8	78.2	65.8	71.9	55.9	6853	78.2
1992	2930.1	615.0	57.4	65.4	57.4	65.4	54.2	55.8	5052	57.5
1993	4353.4	615.0	84.1	66.2	84.1	66.2	80.8	56.8	7370	84.1
1994	4918.0	565.0	95.4	67.3	95.4	67.3	99.4	58.4	8390	95.8
1995	4127.6	565.0	82.9	67.9	82.9	67.9	83.4	59.3	7381	84.3
1996	4676.2	565.0	92.0	68.7	92.0	68.7	94.2	60.5	8133	92.6
1997	2698.6	565.0	51.8	68.1	51.8	68.1	54.5	60.3	4620	52.7
1998	4846.0	565.0	92.3	68.9	92.3	68.9	97.9	61.5	8085	92.3
1999	3564.9	565.0	68.4	68.9	68.4	68.9	72.0	61.9	6162	70.3
2000	4681.8	565.0	91.0	69.6	91.0	69.6	94.3	62.9	8060	91.8
2001	4378.0	565.0	83.5	70.0	83.5	70.0	88.5	63.6	7376	84.2
2002	4904.6	565.0	92.9	70.6	92.9	70.6	99.1	64.6	8194	93.5
2003	4361.4	565.0	83.6	71.0	83.6	71.0	88.1	65.3	7373	84.2
2004	4988.2	565.0	93.5	71.6	93.5	71.6	100.5	66.2	8258	94.0
2005	4589.8	621.0	87.5	72.1	87.5	72.1	84.4	66.8	7667	87.5
2006	5346.9	621.0	99.5	72.8	99.5	72.8	98.3	67.6	8713	99.5
2007	4762.9	621.0	90.3	73.3	90.3	73.3	87.6	68.2	7910	90.3
2008	5341.4	621.0	99.1	74.0	99.1	74.0	97.9	69.0	8707	99.1



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		76		0	724	
B. Refuelling without a maintenance					30	
C. Inspection, maintenance or repair combined with refuelling	1252					
D. Inspection, maintenance or repair without refuelling	142					
E. Testing of plant systems or component	3				0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling	2					
H. Nuclear regulatory requirement	0				4	5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)	5				141	
Subtotal	0	76	0	1404	899	5
Total		76			2308	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		13
12. Reactor I&C Systems		34
13. Reactor Auxiliary System:		27
14. Safety Systems		58
15. Reactor Cooling System:		327
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		46
32. Feedwater and Main Steam System		54
35. All other I&C Systems		2
41. Main Generator System:		17
42. Electrical Power Supply System:		30
XX. Miscellaneous Systems	76	
Total	76	609

# US-410 NINE MILE POINT-2

**Operator:** NMPNSLLC (Nine Mile Point Nuclear Station, LLC)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1140.0 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 2008

**Net Energy Production:** 9082.4 GW(e).h  
**Energy Availability Factor:** 91.8%  
**Load Factor:** 90.7%  
**Operating Factor:** 91.8%  
**Energy Unavailability Factor:** 8.2%  
**Total Off-line Time:** 721 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	851.9	794.0	571.9	337.8	845.8	808.2	826.7	838.5	812.6	843.6	704.2	847.1	9082.4
<b>EAF (%)</b>	100.0	100.0	67.9	45.8	100.0	100.0	100.0	100.0	100.0	100.0	87.4	100.0	91.8
<b>UCF (%)</b>	100.0	100.0	67.9	45.8	100.0	100.0	100.0	100.0	100.0	100.0	87.4	100.0	91.8
<b>LF (%)</b>	100.4	100.1	67.5	41.2	99.7	98.5	97.5	98.9	99.0	99.5	85.7	99.9	90.7
<b>OF (%)</b>	100.0	100.0	67.8	45.7	100.0	100.0	100.0	100.0	100.0	100.0	87.4	100.0	91.8
<b>EUUF (%)</b>	0.0	0.0	32.1	54.2	0.0	0.0	0.0	0.0	0.0	0.0	12.6	0.0	8.2
<b>PUF (%)</b>	0.0	0.0	32.1	54.2	0.0	0.0	0.0	0.0	0.0	0.0	12.6	0.0	8.2
<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	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 24 Jun 1974  
**Date of First Criticality:** 23 May 1987  
**Date of Grid Connection:** 08 Aug 1987  
**Date of Commercial Operation:** 11 Mar 1988

**Lifetime Generation:** 159958.2 GW(e).h  
**Cumulative Energy Availability Factor:** 82.8%  
**Cumulative Load Factor:** 79.8%  
**Cumulative Unit Capability Factor:** 82.8%  
**Cumulative Energy Unavailability Factor:** 17.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	2540.6	1040.0	49.1	49.1	49.1	49.1	33.6	33.6	2800	38.6
1989	4288.3	1068.0	56.4	53.2	56.4	53.2	45.8	40.4	4824	55.1
1990	4140.4	1082.0	54.4	53.6	54.4	53.6	43.7	41.5	4697	53.6
1991	6562.9	1092.0	75.1	59.3	75.1	59.3	68.6	48.7	6484	74.0
1992	5145.0	1075.0	61.8	59.9	61.8	59.9	54.5	49.9	5169	58.8
1993	7191.1	1048.0	82.2	63.6	82.2	63.6	78.3	54.7	7195	82.1
1994	8355.9	994.0	93.9	67.8	93.9	67.8	96.0	60.4	8243	94.1
1995	7253.7	1061.0	78.9	69.2	78.9	69.2	78.0	62.6	6848	78.2
1996	8698.5	1106.0	89.7	71.6	89.7	71.6	89.5	65.8	7811	88.9
1997	8878.0	1105.0	94.9	74.1	94.9	74.1	91.7	68.5	8279	94.5
1998	7307.2	1105.0	80.8	74.7	80.8	74.7	75.5	69.2	7028	80.2
1999	8782.3	1128.0	89.1	76.0	89.1	76.0	88.9	70.9	7810	89.2
2000	8001.5	1123.0	81.7	76.5	81.7	76.5	81.1	71.8	7204	82.0
2001	8858.8	1119.0	90.7	77.5	90.7	77.5	90.4	73.1	7964	90.9
2002	8417.5	1119.0	85.1	78.1	85.1	78.1	85.9	74.0	7473	85.3
2003	9566.9	1119.0	96.4	79.2	96.4	79.2	97.6	75.6	8448	96.4
2004	8643.5	1119.0	88.5	79.8	88.5	79.8	87.9	76.3	7788	88.7
2005	9961.0	1135.0	100.0	81.0	100.0	81.0	100.2	77.7	8760	100.0
2006	9081.6	1135.0	92.5	81.6	92.5	81.6	91.3	78.5	8100	92.5
2007	9201.1	1140.0	94.6	82.3	94.6	82.3	92.1	79.2	8286	94.6
2008	9082.4	1140.0	91.8	82.8	91.8	82.8	90.7	79.8	8063	91.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					411	
B. Refuelling without a maintenance					20	
C. Inspection, maintenance or repair combined with refuelling	628			701		
D. Inspection, maintenance or repair without refuelling	90			322	2	
E. Testing of plant systems or component				2		
J. Grid limitation, failure or grid unavailability					3	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					45	
Subtotal	718	0	0	1025	481	0
Total	718			1506		

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		0
14. Safety Systems		11
15. Reactor Cooling Systems		63
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		35
32. Feedwater and Main Steam System		60
33. Circulating Water System		15
35. All other I&C Systems		51
41. Main Generator Systems		34
42. Electrical Power Supply Systems		67
Total	0	347

## US-338 NORTH ANNA-1

**Operator:** VEPCO (VIRGINIA ELECTRIC POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 903.0 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 2008

**Net Energy Production:** 7986.8 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. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	681.5	636.7	680.8	660.0	680.3	653.7	672.7	674.1	654.1	672.7	639.4	680.7	7986.8
<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>	101.4	101.3	101.5	101.5	101.3	100.5	100.1	100.3	100.6	100.1	98.2	101.3	100.7
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	19 Feb 1971	<b>Lifetime Generation:</b>	191664.0 GW(e).h
<b>Date of First Criticality:</b>	05 Apr 1978	<b>Cumulative Energy Availability Factor:</b>	81.9%
<b>Date of Grid Connection:</b>	17 Apr 1978	<b>Cumulative Load Factor:</b>	79.4%
<b>Date of Commercial Operation:</b>	06 Jun 1978	<b>Cumulative Unit Capability Factor:</b>	81.9%
		<b>Cumulative Energy Unavailability Factor:</b>	18.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1978	3664.5	896.0	81.4	81.4	81.4	81.4	79.5	79.5	4769	92.9
1979	4188.7	898.0	53.2	63.7	53.2	63.7	53.2	62.9	5399	61.6
1980	5631.0	878.0	87.2	72.7	87.2	72.7	73.0	66.8	7589	86.4
1981	4637.9	860.0	65.6	70.7	65.6	70.7	61.6	65.4	5703	65.1
1982	2397.9	865.0	34.7	63.0	34.7	63.0	31.6	58.1	3027	34.6
1983	5310.4	872.0	71.6	64.5	71.6	64.5	69.5	60.2	6277	71.7
1984	3784.8	883.0	50.3	62.4	50.3	62.4	48.8	58.4	4425	50.4
1985	5798.9	892.0	77.9	64.4	77.9	64.4	74.2	60.5	6820	77.9
1986	6310.7	893.0	83.7	66.7	83.7	66.7	80.7	62.9	7327	83.6
1987	3568.9	913.0	52.1	65.1	52.1	65.1	44.6	60.9	4523	51.6
1988	6897.3	915.0	88.6	67.4	88.6	67.4	85.8	63.4	7760	88.3
1989	4303.3	915.0	57.8	66.6	57.8	66.6	53.7	62.5	4978	56.8
1990	7233.5	912.0	99.6	69.3	99.6	69.3	90.5	64.8	8726	99.6
1991	5625.8	911.0	75.2	69.7	75.2	69.7	70.5	65.2	6549	74.8
1992	5358.1	858.0	81.5	70.5	81.5	70.5	71.1	65.6	7225	82.3
1993	5692.6	890.0	73.5	70.7	73.5	70.7	73.0	66.1	6444	73.6
1994	6795.7	900.0	91.6	71.9	91.6	71.9	86.2	67.3	8012	91.5
1995	7839.2	896.0	99.7	73.5	99.7	73.5	99.8	69.2	8733	99.7
1996	6945.5	893.0	91.0	74.5	91.0	74.5	88.5	70.2	7985	90.9
1997	7157.5	893.0	91.3	75.3	91.3	75.3	91.5	71.3	7992	91.2
1998	7217.1	893.0	92.4	76.2	92.4	76.2	92.3	72.3	8091	92.4
1999	8124.5	893.0	100.0	77.3	100.0	77.3	103.9	73.8	8760	100.0
2000	7213.1	893.0	91.1	77.9	91.1	77.9	92.0	74.6	7997	91.0
2001	7120.8	925.0	91.5	78.5	91.5	78.5	87.9	75.2	8010	91.4
2002	8164.3	925.0	100.0	79.4	100.0	79.4	100.8	76.2	8760	100.0
2003	6519.9	925.0	82.2	79.5	82.2	79.5	80.5	76.4	7200	82.2
2004	7418.4	925.0	91.4	80.0	91.4	80.0	91.3	77.0	8023	91.3
2005	8091.9	925.0	99.8	80.7	99.8	80.7	99.9	77.8	8744	99.8
2006	7142.7	924.0	89.8	81.0	89.8	81.0	88.2	78.2	7861	89.7
2007	7215.1	903.0	89.4	81.3	89.4	81.3	91.2	78.7	7854	89.7
2008	7986.8	903.0	100.0	81.9	100.0	81.9	100.7	79.4	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1978 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					408	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling	1000					
D. Inspection, maintenance or repair without refuelling	116					
E. Testing of plant systems or component	10				3	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)	0				2	
Subtotal	0	0	0	1126	417	0
Total	0			1543		

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

System	2008 Hours Lost	1978 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		15
12. Reactor I&C Systems		3
13. Reactor Auxiliary System:		8
14. Safety Systems		18
15. Reactor Cooling System:		46
16. Steam generation system:		114
31. Turbine and auxiliaries		54
32. Feedwater and Main Steam System		19
33. Circulating Water System		3
41. Main Generator System:		10
42. Electrical Power Supply System:		90
Total	0	380

## US-339 NORTH ANNA-2

**Operator:** VEPCO (VIRGINIA ELECTRIC POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 903.0 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 2008

**Net Energy Production:** 6446.6 GW(e).h  
**Energy Availability Factor:** 81.2%  
**Load Factor:** 81.3%  
**Operating Factor:** 81.2%  
**Energy Unavailability Factor:** 18.8%  
**Total Off-line Time:** 1652 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	635.7	467.2	678.3	656.7	677.6	650.4	670.0	671.6	280.7	0.0	376.1	682.5	6446.6
<b>EAF (%)</b>	95.4	75.0	100.0	100.0	100.0	100.0	100.0	100.0	43.4	0.0	59.7	100.0	81.2
<b>UCF (%)</b>	95.4	75.0	100.0	100.0	100.0	100.0	100.0	100.0	43.4	0.0	59.7	100.0	81.2
<b>LF (%)</b>	94.6	74.3	101.1	101.0	100.9	100.0	99.7	100.0	43.2	0.0	57.8	101.6	81.3
<b>OF (%)</b>	95.3	75.0	100.0	100.0	100.0	100.0	100.0	100.0	43.3	0.0	59.6	100.0	81.2
<b>EUF (%)</b>	4.6	25.0	0.0	0.0	0.0	0.0	0.0	0.0	56.6	100.0	40.3	0.0	18.8
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.6	100.0	40.3	0.0	16.4
<b>UCLF (%)</b>	4.7	25.0	0.0	0.0	0.0	0.0	0.0	0.0	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	19 Feb 1971	<b>Lifetime Generation:</b>	184149.7 GW(e).h
<b>Date of First Criticality:</b>	12 Jun 1980	<b>Cumulative Energy Availability Factor:</b>	85.3%
<b>Date of Grid Connection:</b>	25 Aug 1980	<b>Cumulative Load Factor:</b>	82.6%
<b>Date of Commercial Operation:</b>	14 Dec 1980	<b>Cumulative Unit Capability Factor:</b>	85.3%
		<b>Cumulative Energy Unavailability Factor:</b>	14.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1980	349.6	897.0	97.5	97.5	97.5	97.5	90.1	90.1	412	95.4
1981	5652.7	883.0	78.4	79.3	78.4	79.3	73.1	73.9	6813	77.8
1982	4047.2	890.0	57.3	68.5	57.3	68.5	51.9	63.1	4990	57.0
1983	5802.5	890.0	80.7	72.5	80.7	72.5	74.4	66.8	7052	80.5
1984	4717.2	890.0	67.1	71.2	67.1	71.2	60.3	65.2	5896	67.1
1985	6813.6	892.0	94.2	75.8	94.2	75.8	87.2	69.6	8252	94.2
1986	6022.1	893.0	82.2	76.9	82.2	76.9	77.0	70.8	7208	82.3
1987	5653.4	905.0	77.4	76.9	77.4	76.9	71.2	70.9	6783	77.4
1988	7884.0	915.0	99.2	79.8	99.2	79.8	98.1	74.3	8708	99.1
1989	5896.5	915.0	80.2	79.8	80.2	79.8	73.6	74.3	6887	78.6
1990	5976.6	910.0	80.0	79.8	80.0	79.8	74.9	74.3	6982	79.7
1991	7684.3	909.0	97.5	81.4	97.5	81.4	96.5	76.3	8539	97.5
1992	6324.7	909.0	82.6	81.5	82.6	81.5	79.2	76.6	7237	82.4
1993	6225.2	909.0	83.6	81.7	83.6	81.7	78.2	76.7	7303	83.4
1994	7490.3	887.0	97.2	82.8	97.2	82.8	96.4	78.1	8517	97.2
1995	6031.7	892.0	80.8	82.7	80.8	82.7	77.2	78.0	7086	80.9
1996	6121.5	897.0	78.1	82.4	78.1	82.4	77.7	78.0	6859	78.1
1997	7834.8	897.0	99.7	83.4	99.7	83.4	99.7	79.3	8738	99.7
1998	7086.1	897.0	92.1	83.9	91.9	83.9	90.2	79.9	8049	91.9
1999	7185.1	897.0	91.7	84.3	91.7	84.3	91.4	80.5	8034	91.7
2000	8018.9	897.0	99.4	85.0	99.4	85.0	101.8	81.5	8729	99.4
2001	5975.8	917.0	77.4	84.7	77.4	84.7	74.4	81.2	6776	77.4
2002	5509.7	917.0	68.5	83.9	68.5	83.9	68.6	80.6	6000	68.5
2003	7262.8	917.0	90.8	84.2	90.8	84.2	90.4	81.1	7950	90.8
2004	7388.1	917.0	92.0	84.6	92.0	84.5	91.7	81.5	8077	92.0
2005	7293.5	917.0	92.1	84.9	91.7	84.8	90.8	81.9	8034	91.7
2006	7950.4	910.0	99.7	85.4	99.7	85.4	99.7	82.6	8732	99.7
2007	6771.8	903.0	85.8	85.4	85.8	85.4	85.6	82.7	7524	85.9
2008	6446.6	903.0	81.2	85.3	81.2	85.3	81.3	82.6	7132	81.2



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1980 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		208			234	
B. Refuelling without a maintenance outage					11	
C. Inspection, maintenance or repair combined with refuelling	1442			808		
D. Inspection, maintenance or repair without refuelling				73		
E. Testing of plant systems or component				2		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					62	0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Subtotal	1442	208	0	883	307	1
Total		1650			1191	

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

System	2008 Hours Lost	1980 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		3
13. Reactor Auxiliary System		2
14. Safety Systems		21
15. Reactor Cooling System	208	16
16. Steam generation system		37
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		8
32. Feedwater and Main Steam System		18
33. Circulating Water System		0
41. Main Generator System		45
42. Electrical Power Supply System		76
Total	208	227

# US-269 OCONEE-1

**Operator:** DUKE (DUKE POWER CO.)

**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6222.8 GW(e).h  
**Energy Availability Factor:** 86.1%  
**Load Factor:** 83.7%  
**Operating Factor:** 86.1%  
**Energy Unavailability Factor:** 13.9%  
**Total Off-line Time:** 1220 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	643.5	600.0	470.9	164.3	0.0	578.8	632.7	626.7	608.0	634.1	619.8	643.9	6222.8
<b>EAF (%)</b>	100.0	100.0	100.0	36.7	0.0	97.3	100.0	100.0	100.0	100.0	100.0	100.0	86.1
<b>UCF (%)</b>	100.0	100.0	100.0	36.7	0.0	97.3	100.0	100.0	100.0	100.0	100.0	100.0	86.1
<b>LF (%)</b>	102.2	101.9	74.9	27.0	0.0	95.0	100.5	99.6	99.8	100.7	101.6	102.3	83.7
<b>OF (%)</b>	100.0	100.0	100.0	36.7	0.0	97.2	100.0	100.0	100.0	100.0	100.0	100.0	86.1
<b>EUF (%)</b>	0.0	0.0	0.0	63.3	100.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	13.9
<b>PUF (%)</b>	0.0	0.0	0.0	63.3	100.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	13.9
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 06 Nov 1967  
**Date of First Criticality:** 19 Apr 1973  
**Date of Grid Connection:** 06 May 1973  
**Date of Commercial Operation:** 15 Jul 1973

**Lifetime Generation:** 202113.3 GW(e).h  
**Cumulative Energy Availability Factor:** 79.5%  
**Cumulative Load Factor:** 76.2%  
**Cumulative Unit Capability Factor:** 79.8%  
**Cumulative Energy Unavailability Factor:** 20.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	1959.1	721.0	70.5	70.5	70.5	70.5	67.3	67.3	3350	75.9
1974	4230.3	920.0	100.0	92.2	100.0	92.2	52.5	56.4	5141	58.7
1975	5299.3	871.0	69.5	82.9	69.5	82.9	69.5	61.8	6672	76.2
1976	4003.5	871.0	52.4	74.0	52.4	74.0	52.3	59.0	5029	57.3
1977	3949.0	860.0	52.5	69.2	52.5	69.2	52.4	57.5	5455	62.3
1978	5054.4	860.0	67.1	68.8	67.1	68.8	67.1	59.3	6299	71.9
1979	5003.1	860.0	66.4	68.4	66.4	68.4	66.4	60.4	6220	71.0
1980	5118.3	860.0	86.3	70.8	76.2	69.5	67.8	61.4	6634	75.5
1981	3023.2	860.0	42.9	67.5	42.9	66.4	40.1	58.9	3657	41.7
1982	5152.8	860.0	73.5	68.2	73.5	67.1	68.4	59.9	6335	72.3
1983	5672.0	860.0	78.4	69.2	78.4	68.2	75.3	61.3	6804	77.7
1984	6173.7	860.0	83.6	70.4	83.6	69.5	81.7	63.1	7312	83.2
1985	7066.0	860.0	96.2	72.5	96.2	71.7	93.8	65.6	8424	96.2
1986	4793.9	860.0	70.2	72.3	70.2	71.6	63.6	65.4	5870	67.0
1987	5031.1	860.0	76.8	72.6	76.8	71.9	66.8	65.5	6693	76.4
1988	7192.2	846.0	99.5	74.3	99.5	73.7	96.8	67.5	8742	99.5
1989	5943.1	846.0	82.9	74.9	82.9	74.2	80.2	68.3	7264	82.9
1990	6454.8	846.0	88.5	75.6	88.5	75.0	87.1	69.3	7751	88.5
1991	6022.5	846.0	82.7	76.0	82.7	75.4	81.3	70.0	7245	82.7
1992	6277.7	846.0	85.3	76.5	85.3	76.0	84.5	70.7	7494	85.3
1993	6525.1	846.0	89.4	77.1	89.4	76.6	88.0	71.5	7833	89.4
1994	6088.7	846.0	83.4	77.4	83.4	76.9	82.2	72.0	7302	83.4
1995	6360.5	846.0	86.1	77.8	86.1	77.3	85.8	72.6	7537	86.0
1996	5567.0	846.0	75.2	77.7	75.2	77.2	74.9	72.7	6606	75.2
1997	3194.2	846.0	51.3	76.6	51.3	76.2	43.1	71.5	4482	51.2
1998	5996.4	846.0	82.8	76.8	82.8	76.4	80.9	71.9	7255	82.8
1999	6212.6	846.0	85.1	77.1	85.1	76.8	83.8	72.4	7383	84.3
2000	6312.7	846.0	84.8	77.4	84.8	77.1	84.9	72.8	7445	84.8
2001	6962.6	846.0	94.0	78.0	94.0	77.6	94.0	73.5	8210	93.7
2002	6607.5	846.0	88.9	78.4	88.9	78.0	89.2	74.1	7788	88.9
2003	5258.6	846.0	71.8	78.2	71.8	77.8	71.0	74.0	6288	71.8
2004	7260.2	846.0	97.3	78.8	97.3	78.4	97.7	74.7	8549	97.3
2005	6728.6	846.0	90.0	79.1	90.0	78.8	90.8	75.2	7879	89.9
2006	5819.4	846.0	78.6	79.1	78.6	78.8	78.5	75.3	6884	78.6
2007	7335.7	846.0	97.7	79.6	97.7	79.3	99.0	76.0	8562	97.7
2008	6222.8	846.0	86.1	79.8	86.1	79.5	83.7	76.2	7564	86.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1973 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					565	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1218			878		
D. Inspection, maintenance or repair without refuelling				156	2	
E. Testing of plant systems or component	0			23	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirement				2	0	32
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	0
Subtotal	1218	0	0	1059	568	32
Total	1218			1659		

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

System	2008 Hours Lost	1973 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		44
12. Reactor I&C Systems		63
13. Reactor Auxiliary System:		2
14. Safety Systems		40
15. Reactor Cooling System:		120
16. Steam generation system:		157
17. Safety I&C Systems (excluding reactor I&C)		0
21. Fuel Handling and Storage Facilities		0
31. Turbine and auxiliaries		48
32. Feedwater and Main Steam System		19
41. Main Generator System:		16
42. Electrical Power Supply System:		15
XX. Miscellaneous Systems		20
Total	0	544

## US-270 OCONEE-2

**Operator:** DUKE (DUKE POWER CO.)

**Contractor:** B&W (BABCOCK & WILCOX CO.)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 6392.5 GW(e).h  
**Energy Availability Factor:** 85.1%  
**Load Factor:** 86.0%  
**Operating Factor:** 85.0%  
**Energy Unavailability Factor:** 14.9%  
**Total Off-line Time:** 1314 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	651.9	608.6	640.5	583.1	643.8	623.3	637.1	631.1	514.9	491.3	0.0	366.9	6392.5
<b>EAF (%)</b>	100.0	100.0	98.6	94.5	100.0	100.0	100.0	100.0	87.9	77.6	0.0	61.4	85.1
<b>UCF (%)</b>	100.0	100.0	98.6	94.5	100.0	100.0	100.0	100.0	87.9	77.6	0.0	61.4	85.1
<b>LF (%)</b>	103.6	103.4	101.9	95.7	102.3	102.3	101.2	100.3	84.5	78.1	0.0	58.3	86.0
<b>OF (%)</b>	100.0	100.0	98.5	94.4	100.0	100.0	100.0	100.0	87.9	77.6	0.0	61.3	85.0
<b>EUF (%)</b>	0.0	0.0	1.4	5.5	0.0	0.0	0.0	0.0	12.1	22.4	100.0	38.6	14.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.4	100.0	37.8	13.3
<b>UCLF (%)</b>	0.0	0.0	1.4	5.5	0.0	0.0	0.0	0.0	12.1	0.0	0.0	0.8	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	06 Nov 1967	<b>Lifetime Generation:</b>	202167.5 GW(e).h
<b>Date of First Criticality:</b>	11 Nov 1973	<b>Cumulative Energy Availability Factor:</b>	80.9%
<b>Date of Grid Connection:</b>	05 Dec 1973	<b>Cumulative Load Factor:</b>	78.5%
<b>Date of Commercial Operation:</b>	09 Sep 1974	<b>Cumulative Unit Capability Factor:</b>	81.1%
		<b>Cumulative Energy Unavailability Factor:</b>	19.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	1470.1	920.0	100.0	100.0	100.0	100.0	54.6	54.6	1812	61.9
1975	4970.6	871.0	65.2	74.3	65.2	74.3	65.1	62.4	6398	73.0
1976	4232.6	871.0	55.4	66.2	55.4	66.2	55.3	59.4	5483	62.4
1977	3830.0	860.0	50.9	61.7	50.9	61.7	50.8	56.9	5315	60.7
1978	4786.2	860.0	63.5	62.1	63.5	62.1	63.5	58.4	6155	70.3
1979	5968.2	860.0	79.2	65.3	79.2	65.3	79.2	62.2	7532	86.0
1980	3882.0	860.0	69.6	66.0	62.0	64.8	51.4	60.5	5397	61.4
1981	5198.9	860.0	81.0	68.0	81.0	67.0	69.0	61.7	7050	80.5
1982	3447.7	860.0	53.5	66.3	53.5	65.4	45.8	59.8	4580	52.3
1983	5147.0	860.0	73.2	67.0	73.2	66.2	68.3	60.7	6348	72.5
1984	7298.0	860.0	100.0	70.2	100.0	69.5	96.6	64.2	8784	100.0
1985	5060.0	860.0	76.3	70.7	76.3	70.1	67.2	64.4	6654	76.0
1986	5803.1	860.0	81.4	71.6	81.4	71.0	77.0	65.4	7169	81.8
1987	6228.7	860.0	98.0	73.6	98.0	73.0	82.7	66.7	8565	97.8
1988	5540.0	846.0	78.3	73.9	78.3	73.4	74.5	67.3	6880	78.3
1989	6013.1	846.0	83.1	74.5	83.1	74.0	81.1	68.2	7272	83.0
1990	6269.4	846.0	85.3	75.1	85.3	74.7	84.6	69.1	7469	85.3
1991	7427.9	846.0	100.0	76.5	100.0	76.1	100.2	70.9	8760	100.0
1992	5946.9	846.0	80.9	76.8	80.9	76.4	80.0	71.4	7103	80.9
1993	6236.3	846.0	83.9	77.1	83.9	76.7	84.1	72.1	7352	83.9
1994	6148.5	846.0	83.3	77.4	83.3	77.1	83.0	72.6	7292	83.2
1995	6973.9	846.0	94.3	78.2	94.3	77.9	94.1	73.6	8263	94.3
1996	4432.0	846.0	60.4	77.4	60.4	77.1	59.6	73.0	5304	60.4
1997	5876.8	846.0	79.7	77.5	79.7	77.2	79.3	73.2	6974	79.6
1998	5654.7	846.0	77.4	77.5	77.4	77.2	76.3	73.4	6776	77.4
1999	6257.6	846.0	84.2	77.8	84.2	77.5	84.4	73.8	7374	84.2
2000	7499.5	846.0	100.0	78.6	100.0	78.3	100.9	74.8	8784	100.0
2001	6688.4	846.0	89.5	79.0	89.5	78.7	90.3	75.4	7836	89.5
2002	6611.1	846.0	88.4	79.3	88.4	79.1	89.2	75.8	7743	88.4
2003	7568.7	846.0	100.0	80.0	100.0	79.8	102.1	76.7	8760	100.0
2004	5676.1	846.0	75.8	79.9	75.8	79.6	76.4	76.7	6652	75.7
2005	6672.3	846.0	89.1	80.2	89.1	79.9	90.0	77.1	7808	89.1
2006	7391.9	846.0	97.6	80.7	97.6	80.5	99.7	77.8	8552	97.6
2007	6769.0	846.0	90.0	81.0	90.0	80.8	91.3	78.2	7878	89.9
2008	6392.5	846.0	85.1	81.1	85.1	80.9	86.0	78.5	7470	85.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		132		0	558	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1168			881		
D. Inspection, maintenance or repair without refuelling				66	2	
E. Testing of plant systems or component:	1			5	1	
H. Nuclear regulatory requirement				0		30
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					0	
L. Human factor related		10				
Subtotal	1169	142	0	952	562	30
Total		1311			1544	

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		41
12. Reactor I&C Systems		60
13. Reactor Auxiliary System:		10
14. Safety Systems		45
15. Reactor Cooling System:		103
16. Steam generation system:	4	113
31. Turbine and auxiliaries	39	151
32. Feedwater and Main Steam System	1	8
33. Circulating Water System		2
41. Main Generator System:		7
42. Electrical Power Supply System:	86	13
Total	130	553

## US-287 OCONEE-3

Operator: DUKE (DUKE POWER CO.)

Contractor: B&amp;W (BABCOCK &amp; WILCOX CO.)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 7575.1 GW(e).h  
 Energy Availability Factor: 99.2%  
 Load Factor: 101.9%  
 Operating Factor: 99.2%  
 Energy Unavailability Factor: 0.8%  
 Total Off-line Time: 67 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	651.4	611.3	652.3	631.9	651.7	627.2	642.1	635.9	616.4	643.9	561.7	649.4	7575.1
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.7	100.0	99.2
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.7	100.0	99.2
LF (%)	103.5	103.8	103.8	103.7	103.5	103.0	102.0	101.0	101.2	102.3	92.1	103.2	101.9
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.7	100.0	99.2
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3	0.0	0.8
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	9.3	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. 2008 Summary of Operation



## 5. Historical Summary

<b>Date of Construction Start:</b>	06 Nov 1967	<b>Lifetime Generation:</b>	199104.3 GW(e).h
<b>Date of First Criticality:</b>	05 Sep 1974	<b>Cumulative Energy Availability Factor:</b>	79.7%
<b>Date of Grid Connection:</b>	18 Sep 1974	<b>Cumulative Load Factor:</b>	78.1%
<b>Date of Commercial Operation:</b>	16 Dec 1974	<b>Cumulative Unit Capability Factor:</b>	80.0%
		<b>Cumulative Energy Unavailability Factor:</b>	20.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	0.0	854.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1975	5037.4	871.0	66.1	68.7	66.1	68.7	66.0	60.9	6761	77.2
1976	4758.0	871.0	62.3	65.6	62.3	65.6	62.2	61.5	6072	69.1
1977	5268.7	860.0	69.9	67.0	69.9	67.0	69.9	64.2	6545	74.7
1978	6064.3	860.0	80.5	70.3	80.5	70.3	80.5	68.2	7444	85.0
1979	3278.9	860.0	43.5	65.0	43.5	65.0	43.5	63.3	4038	46.1
1980	5224.6	860.0	84.8	68.3	73.8	66.5	69.2	64.3	6414	73.0
1981	5641.4	860.0	78.6	69.7	78.6	68.2	74.9	65.8	6835	78.0
1982	2128.4	860.0	33.5	65.3	33.5	63.9	28.3	61.2	2826	32.3
1983	7099.1	860.0	96.5	68.7	96.5	67.5	94.2	64.8	8436	96.3
1984	5355.5	860.0	74.2	69.2	74.2	68.2	70.9	65.4	6474	73.7
1985	4860.8	860.0	69.7	69.3	69.7	68.3	64.5	65.3	6071	69.3
1986	6064.3	860.0	90.0	71.0	90.0	70.1	80.5	66.6	7781	88.8
1987	5094.4	860.0	69.8	70.9	69.8	70.1	67.6	66.6	6068	69.3
1988	5965.8	846.0	81.9	71.7	81.9	70.9	80.3	67.6	7190	81.9
1989	6337.4	846.0	86.6	72.6	86.6	71.9	85.5	68.8	7585	86.6
1990	7427.8	846.0	99.5	74.3	99.5	73.6	100.2	70.7	8712	99.5
1991	5594.6	846.0	86.6	75.0	86.6	74.3	75.5	71.0	6691	76.4
1992	5448.2	846.0	75.5	75.0	75.5	74.4	73.3	71.1	6634	75.5
1993	7393.8	846.0	98.7	76.2	98.7	75.7	99.8	72.6	8647	98.7
1994	5670.8	846.0	77.5	76.3	77.5	75.8	76.5	72.8	6781	77.4
1995	6467.8	846.0	87.1	76.8	87.1	76.3	87.3	73.5	7625	87.0
1996	5454.0	846.0	73.2	76.6	73.2	76.1	73.4	73.5	6429	73.2
1997	4652.6	846.0	64.6	76.1	64.6	75.7	62.8	73.0	5633	64.3
1998	5786.4	846.0	80.1	76.3	80.1	75.8	78.1	73.2	7026	80.2
1999	7369.5	846.0	99.0	77.2	99.0	76.8	99.4	74.2	8676	99.0
2000	6577.8	846.0	88.0	77.6	88.0	77.2	88.5	74.8	7729	88.0
2001	5398.5	846.0	72.6	77.4	72.6	77.0	72.8	74.7	6355	72.5
2002	7465.5	846.0	99.2	78.2	99.2	77.8	100.7	75.6	8688	99.2
2003	6318.0	846.0	85.2	78.4	85.2	78.0	85.3	76.0	7467	85.2
2004	5747.0	846.0	76.3	78.4	76.3	78.0	77.3	76.0	6698	76.3
2005	7237.0	846.0	95.9	78.9	95.9	78.6	97.6	76.7	8395	95.8
2006	6716.2	846.0	89.1	79.2	89.1	78.9	90.6	77.1	7804	89.1
2007	6461.9	846.0	85.6	79.4	85.6	79.1	87.2	77.4	7498	85.6
2008	7575.1	846.0	99.2	80.0	99.2	79.7	101.9	78.1	8717	99.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		66		3	515	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling				919		
D. Inspection, maintenance or repair without refuelling				119	0	
E. Testing of plant systems or component:				7	4	
H. Nuclear regulatory requirement					81	33
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	14	0
Subtotal	0	66	0	1048	616	33
Total		66			1697	

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		15
12. Reactor I&C Systems	66	94
13. Reactor Auxiliary System:		36
14. Safety Systems		24
15. Reactor Cooling System:		69
16. Steam generation system:		134
21. Fuel Handling and Storage Facilities		1
31. Turbine and auxiliaries		70
32. Feedwater and Main Steam System		21
41. Main Generator System:		5
42. Electrical Power Supply System:		6
XX. Miscellaneous Systems		17
Total	66	492

## US-219 OYSTER CREEK

**Operator:** AMERGEN (AMERGEN ENERGY Co.)

**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 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 2008

**Net Energy Production:** 4664.0 GW(e).h  
**Energy Availability Factor:** 90.2%  
**Load Factor:** 85.8%  
**Operating Factor:** 90.2%  
**Energy Unavailability Factor:** 9.8%  
**Total Off-line Time:** 860 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	424.2	400.4	422.2	356.8	459.3	434.3	442.6	449.7	437.7	326.5	121.4	388.9	4664.0
<b>EAF (%)</b>	100.0	100.0	100.0	89.1	100.0	100.0	100.0	100.0	100.0	77.4	32.6	83.0	90.2
<b>UCF (%)</b>	100.0	100.0	100.0	89.1	100.0	100.0	100.0	100.0	100.0	77.4	32.6	83.0	90.2
<b>LF (%)</b>	92.1	92.9	91.8	80.1	99.7	97.4	96.1	97.6	98.2	70.9	27.2	84.4	85.8
<b>OF (%)</b>	100.0	100.0	100.0	89.0	100.0	100.0	100.0	100.0	100.0	77.4	32.6	82.9	90.2
<b>EUF (%)</b>	0.0	0.0	0.0	10.9	0.0	0.0	0.0	0.0	0.0	22.6	67.4	17.0	9.8
<b>PUF (%)</b>	0.0	0.0	0.0	10.9	0.0	0.0	0.0	0.0	0.0	22.6	60.3	0.0	7.8
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	17.0	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 15 Dec 1964  
**Date of First Criticality:** 03 May 1969  
**Date of Grid Connection:** 23 Sep 1969  
**Date of Commercial Operation:** 01 Dec 1969

**Lifetime Generation:** 147820.7 GW(e).h  
**Cumulative Energy Availability Factor:** 74.9%  
**Cumulative Load Factor:** 69.7%  
**Cumulative Unit Capability Factor:** 74.9%  
**Cumulative Energy Unavailability Factor:** 25.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1969	0.0	619.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1970	3591.0	540.0	100.0	100.0	100.0	100.0	75.9	69.2	6788	77.5
1971	3972.6	595.0	100.0	100.0	100.0	100.0	76.2	72.7	7046	80.4
1972	4503.8	670.0	100.0	100.0	100.0	100.0	76.5	74.1	7137	81.3
1973	3589.0	620.0	73.8	93.5	73.8	93.5	66.1	72.1	6401	73.1
1974	3679.6	650.0	66.6	87.9	66.6	87.9	64.6	70.5	6163	70.4
1975	3148.7	610.0	59.1	83.2	59.1	83.2	58.9	68.6	6414	73.2
1976	3860.1	620.0	70.9	81.4	70.9	81.4	70.9	69.0	6966	79.3
1977	3249.2	620.0	59.9	78.7	59.9	78.7	59.8	67.8	6136	70.0
1978	3645.7	620.0	66.5	77.4	66.5	77.4	67.1	67.7	6508	74.3
1979	4563.3	620.0	83.8	78.0	83.8	78.0	84.0	69.4	7520	85.8
1980	1957.3	620.0	41.8	74.7	41.8	74.7	35.9	66.3	3662	41.7
1981	2628.9	620.0	59.9	73.5	59.9	73.5	48.4	64.8	5237	59.8
1982	2013.0	620.0	62.5	72.7	62.5	72.7	37.1	62.7	5474	62.5
1983	225.5	620.0	11.5	68.3	11.5	68.3	4.2	58.5	1007	11.5
1984	305.2	620.0	9.6	64.4	9.6	64.4	5.6	55.0	842	9.6
1985	3746.0	620.0	74.5	65.0	74.5	65.0	69.0	55.9	6518	74.4
1986	1317.7	620.0	26.7	62.8	26.7	62.8	24.3	54.0	2310	26.4
1987	3113.4	620.0	62.0	62.7	62.0	62.7	57.3	54.2	5421	61.9
1988	3547.3	620.0	65.5	62.9	65.5	62.9	65.1	54.8	5749	65.4
1989	2410.1	620.0	53.6	62.4	53.6	62.4	44.4	54.3	4686	53.5
1990	4305.1	620.0	87.7	63.6	87.7	63.6	79.3	55.5	7678	87.6
1991	2954.8	619.0	59.0	63.4	59.0	63.4	54.5	55.4	5167	59.0
1992	4531.8	610.0	84.9	64.3	84.9	64.3	84.6	56.7	7463	85.0
1993	4667.5	610.0	87.4	65.3	87.4	65.3	87.3	57.9	7654	87.4
1994	3633.3	610.0	69.2	65.4	69.2	65.4	67.9	58.3	6096	69.6
1995	5194.1	619.0	97.2	66.7	97.2	66.7	95.8	59.7	8511	97.2
1996	4339.4	619.0	80.9	67.2	80.9	67.2	79.8	60.5	7104	80.9
1997	5073.3	619.0	93.2	68.1	93.2	68.1	93.6	61.7	8164	93.2
1998	4302.2	619.0	81.0	68.6	81.0	68.6	79.3	62.3	7094	81.0
1999	5388.5	619.0	100.0	69.6	100.0	69.6	99.4	63.5	8760	100.0
2000	3908.2	619.0	80.6	70.0	80.6	70.0	71.9	63.8	7073	80.5
2001	5226.4	619.0	97.0	70.8	97.0	70.8	96.4	64.8	8497	97.0
2002	5031.3	619.0	93.8	71.5	93.8	71.5	92.8	65.6	8215	93.8
2003	5256.3	619.0	96.7	72.2	96.7	72.2	96.9	66.6	8468	96.7
2004	4847.0	619.0	90.8	72.8	90.8	72.8	89.1	67.2	7973	90.8
2005	5374.9	619.0	100.0	73.5	99.4	73.5	99.1	68.1	8706	99.4
2006	4644.5	619.0	88.8	73.9	88.8	73.9	85.7	68.6	7775	88.8
2007	5077.9	619.0	96.3	74.5	96.3	74.5	93.6	69.2	8435	96.3
2008	4664.0	619.0	90.2	74.9	90.2	74.9	85.8	69.7	7924	90.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		177			601	
B. Refuelling without a maintenance					32	
C. Inspection, maintenance or repair combined with refuelling	602			1359		
D. Inspection, maintenance or repair without refuelling	78			94		
E. Testing of plant systems or component				4	28	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirement					14	8
J. Grid limitation, failure or grid unavailability					1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					61	
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	680	177	0	1457	737	9
Total		857			2203	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		13
13. Reactor Auxiliary Systems		9
14. Safety Systems		164
15. Reactor Cooling Systems		154
31. Turbine and auxiliaries		37
32. Feedwater and Main Steam System		66
33. Circulating Water System		6
35. All other I&C Systems		6
41. Main Generator Systems		31
42. Electrical Power Supply Systems	177	22
XX. Miscellaneous Systems		5
Total	177	513

# US-255 PALISADES

**Operator:** CONSENEC (Consumers Energy Co.)

**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 778.0 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 2008

**Net Energy Production:** 6837.2 GW(e).h  
**Energy Availability Factor:** 97.9%  
**Load Factor:** 100.0%  
**Operating Factor:** 97.9%  
**Energy Unavailability Factor:** 2.1%  
**Total Off-line Time:** 185 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	544.2	566.4	607.1	579.8	556.4	567.1	582.1	486.7	567.3	595.1	581.8	603.3	6837.2
<b>EAF (%)</b>	94.4	100.0	100.0	100.0	95.0	100.0	100.0	85.9	100.0	100.0	100.0	100.0	97.9
<b>UCF (%)</b>	94.4	100.0	100.0	100.0	95.0	100.0	100.0	85.9	100.0	100.0	100.0	100.0	97.9
<b>LF (%)</b>	94.0	104.6	105.0	103.5	96.1	101.2	100.6	84.1	101.3	102.8	103.7	104.2	100.0
<b>OF (%)</b>	94.4	100.0	100.0	100.0	94.9	100.0	100.0	85.9	100.0	100.0	100.0	100.0	97.9
<b>EUF (%)</b>	5.6	0.0	0.0	0.0	5.0	0.0	0.0	14.1	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>	5.6	0.0	0.0	0.0	5.0	0.0	0.0	14.1	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	14 Mar 1967	<b>Lifetime Generation:</b>	148750.6 GW(e).h
<b>Date of First Criticality:</b>	24 May 1971	<b>Cumulative Energy Availability Factor:</b>	68.6%
<b>Date of Grid Connection:</b>	31 Dec 1971	<b>Cumulative Load Factor:</b>	65.5%
<b>Date of Commercial Operation:</b>	31 Dec 1971	<b>Cumulative Unit Capability Factor:</b>	69.6%
		<b>Cumulative Energy Unavailability Factor:</b>	31.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1971			Data not provided							
1972	1899.1	400.0	100.0	100.0	100.0	100.0	54.0	54.0	4990	56.8
1973	2411.3	700.0	100.0	100.0	100.0	100.0	39.3	44.7	3829	43.7
1974	93.3	722.0	100.0	100.0	100.0	100.0	1.5	27.6	317	3.6
1975	2427.8	684.0	40.5	83.8	40.5	83.8	40.5	31.1	5649	64.5
1976	2846.9	684.0	47.4	76.0	47.4	76.0	47.4	34.6	4847	55.2
1977	5084.6	635.0	90.2	78.3	90.2	78.3	91.4	44.0	8004	91.4
1978	2624.2	635.0	46.0	73.7	46.0	73.7	47.2	44.5	4346	49.6
1979	3433.4	635.0	58.7	71.9	58.7	71.9	61.7	46.6	5241	59.8
1980	2379.1	635.0	80.0	72.8	39.7	68.3	42.7	46.2	3764	42.9
1981	3462.7	635.0	55.8	71.1	55.8	67.0	62.2	47.8	5009	57.2
1982	3345.0	635.0	49.3	69.1	49.3	65.4	60.1	48.9	4788	54.7
1983	3770.0	635.0	60.1	68.3	60.1	65.0	67.8	50.5	5282	60.3
1984	811.5	635.0	10.0	63.9	10.0	60.8	14.5	47.7	1334	15.2
1985	5301.8	658.0	82.0	65.2	82.0	62.3	91.8	51.0	7342	83.8
1986	841.2	730.0	14.9	61.4	14.9	58.7	13.2	48.1	1323	15.1
1987	2634.4	730.0	45.2	60.3	45.2	57.8	41.2	47.6	3980	45.4
1988	3435.2	730.0	53.7	59.8	53.7	57.5	53.6	48.0	4853	55.2
1989	3637.8	730.0	67.4	60.3	67.4	58.1	56.9	48.6	6019	68.7
1990	3008.1	730.0	56.1	60.0	56.1	58.0	47.0	48.5	5073	57.9
1991	4873.8	730.0	75.4	60.9	75.4	59.0	76.2	50.0	6693	76.4
1992	4865.1	730.0	70.5	61.4	70.5	59.6	75.9	51.3	6293	71.6
1993	3545.7	730.0	50.4	60.8	50.4	59.1	55.4	51.5	4595	52.5
1994	4513.8	730.0	65.5	61.1	65.5	59.4	70.6	52.4	5860	66.9
1995	4663.5	730.0	73.0	61.6	73.0	60.0	72.9	53.4	6491	74.1
1996	5314.3	730.0	79.7	62.4	79.7	60.9	82.9	54.6	7068	80.5
1997	5803.5	730.0	87.6	63.4	87.6	62.0	90.8	56.1	7714	88.1
1998	5390.6	730.0	81.1	64.1	81.1	62.7	84.3	57.2	7142	81.5
1999	5128.4	730.0	78.4	64.7	78.4	63.3	80.2	58.1	6910	78.9
2000	5748.0	730.0	86.8	65.5	86.8	64.2	89.6	59.3	7672	87.3
2001	2355.6	730.0	35.2	64.4	35.2	63.2	36.8	58.5	3118	35.6
2002	6369.4	730.0	94.2	65.4	93.2	64.2	99.6	59.9	8187	93.5
2003	6158.2	730.0	90.0	66.2	90.0	65.0	96.3	61.1	7914	90.3
2004	5346.1	730.0	81.1	66.7	81.1	65.6	83.4	61.8	7164	81.6
2005	6645.8	767.0	96.4	67.7	96.4	66.6	98.9	63.0	8443	96.4
2006	5917.1	778.0	85.6	68.2	85.6	67.2	86.8	63.8	7498	85.6
2007	5826.0	778.0	84.8	68.8	84.8	67.7	85.5	64.4	7427	84.8
2008	6837.2	778.0	97.9	69.6	97.9	68.6	100.0	65.5	8599	97.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		183			1594	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling				1138		
D. Inspection, maintenance or repair without refuelling				155		
E. Testing of plant systems or component				1		
F. Major back-fitting, refurbishment or upgrading activities with refuelling					6	
H. Nuclear regulatory requirement					11	95
J. Grid limitation, failure or grid unavailability						6
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					25	
L. Human factor related					3	
P. Fire					1	
Subtotal	0	183	0	1294	1645	101
Total		183			3040	

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	104	138
13. Reactor Auxiliary Systems		139
14. Safety Systems		94
15. Reactor Cooling Systems		124
16. Steam generation systems		427
31. Turbine and auxiliaries		103
32. Feedwater and Main Steam System	41	90
33. Circulating Water System		34
35. All other I&C Systems		0
41. Main Generator Systems	37	56
42. Electrical Power Supply Systems		251
XX. Miscellaneous Systems		1
Total	182	1457



# US-528 PALO VERDE-1

Operator: AZPSCO (ARIZONA PUBLIC SERVICE CO.)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 9953.1 GW(e).h  
 Energy Availability Factor: 86.7%  
 Load Factor: 86.4%  
 Operating Factor: 86.7%  
 Energy Unavailability Factor: 13.3%  
 Total Off-line Time: 1168 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	986.7	924.3	986.4	950.5	984.7	834.8	972.9	974.6	933.5	89.1	320.1	995.6	9953.1
EAF (%)	100.0	100.0	100.0	100.0	100.0	90.6	100.0	100.0	100.0	9.7	40.6	100.0	86.7
UCF (%)	100.0	100.0	100.0	100.0	100.0	90.6	100.0	100.0	100.0	9.7	40.6	100.0	86.7
LF (%)	101.2	101.3	101.1	100.7	101.0	88.4	99.7	99.9	98.9	9.1	33.9	102.1	86.4
OF (%)	100.0	100.0	100.0	100.0	100.0	90.6	100.0	100.0	100.0	9.7	40.6	100.0	86.7
EUf (%)	0.0	0.0	0.0	0.0	0.0	9.4	0.0	0.0	0.0	90.3	59.4	0.0	13.3
PUf (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.3	59.4	0.0	12.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	9.4	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 25 May 1976  
 Date of First Criticality: 25 May 1985  
 Date of Grid Connection: 10 Jun 1985  
 Date of Commercial Operation: 28 Jan 1986

Lifetime Generation: 187702.9 GW(e).h  
 Cumulative Energy Availability Factor: 76.8%  
 Cumulative Load Factor: 74.6%  
 Cumulative Unit Capability Factor: 77.0%  
 Cumulative Energy Unavailability Factor: 23.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	6264.7	1221.0	66.6	66.6	66.6	66.6	60.5	60.5	5349	63.1
1987	5268.3	1221.0	50.9	58.6	50.9	58.6	49.3	54.8	4500	51.4
1988	6668.7	1221.0	62.8	60.0	62.8	60.0	62.2	57.3	5585	63.6
1989	1796.6	1221.0	14.1	48.5	14.1	48.5	16.8	47.1	1522	17.4
1990	4719.5	1221.0	42.6	47.3	42.6	47.3	44.1	46.5	3925	44.8
1991	9312.1	1221.0	87.1	54.0	85.8	53.7	87.1	53.3	7567	86.4
1992	7118.8	1221.0	67.2	55.9	67.2	55.7	66.4	55.2	6010	68.4
1993	7514.8	1221.0	76.1	58.4	76.1	58.2	70.3	57.1	6665	76.1
1994	9772.5	1221.0	98.8	62.9	98.8	62.7	91.4	60.9	8656	98.8
1995	8526.8	1224.0	82.1	64.8	82.1	64.7	79.5	62.8	7244	82.7
1996	8713.0	1227.0	84.4	66.6	82.0	66.3	80.8	64.4	7246	82.5
1997	10737.7	1244.0	98.8	69.3	98.8	69.0	98.5	67.3	8658	98.8
1998	9575.0	1243.0	89.0	70.9	89.0	70.6	87.9	68.9	7819	89.3
1999	9653.9	1243.0	88.8	72.2	88.8	71.9	88.7	70.4	7774	88.7
2000	10966.6	1243.0	99.8	74.1	99.8	73.8	100.4	72.4	8770	99.8
2001	9559.6	1243.0	88.0	74.9	88.0	74.7	87.8	73.4	7712	88.0
2002	9705.0	1243.0	90.1	75.8	90.1	75.6	89.1	74.3	7890	90.1
2003	10587.1	1243.0	98.2	77.1	98.2	76.9	97.2	75.6	8604	98.2
2004	9235.8	1243.0	88.5	77.7	87.3	77.5	84.6	76.1	7669	87.3
2005	7212.3	1243.0	70.7	77.4	70.7	77.1	66.2	75.6	6194	70.7
2006	4868.2	1314.0	60.4	76.5	60.4	76.3	42.3	73.9	5292	60.4
2007	8844.9	1311.0	78.0	76.6	78.0	76.4	77.0	74.0	6834	78.0
2008	9953.1	1311.0	86.7	77.0	86.7	76.8	86.4	74.6	7616	86.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		67			559	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	1098			1159		
D. Inspection, maintenance or repair without refuelling				197		
E. Testing of plant systems or component:	1			3	11	
J. Grid limitation, failure or grid unavailability						5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					23	11
Subtotal	1099	67	0	1359	600	16
Total		1166			1975	

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		99
13. Reactor Auxiliary System:		4
14. Safety Systems	67	15
15. Reactor Cooling System:		77
16. Steam generation system:		50
31. Turbine and auxiliaries		5
32. Feedwater and Main Steam System		128
33. Circulating Water System		3
35. All other I&C Systems		2
41. Main Generator System:		8
42. Electrical Power Supply System:		72
XX. Miscellaneous Systems		1
Total	67	464

# US-529 PALO VERDE-2

Operator: AZPSCO (ARIZONA PUBLIC SERVICE CO.)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 8624.1 GW(e).h  
 Energy Availability Factor: 74.9%  
 Load Factor: 74.7%  
 Operating Factor: 74.9%  
 Energy Unavailability Factor: 25.1%  
 Total Off-line Time: 2207 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	996.9	934.0	897.5	0.0	0.0	713.8	980.6	980.8	953.0	992.8	671.2	503.5	8624.1
EAF (%)	100.0	100.0	90.3	0.0	0.0	85.0	100.0	100.0	100.0	100.0	70.0	53.4	74.9
UCF (%)	100.0	100.0	90.3	0.0	0.0	85.0	100.0	100.0	100.0	100.0	70.0	53.4	74.9
LF (%)	102.0	102.1	91.8	0.0	0.0	75.5	100.3	100.3	100.7	101.6	70.9	51.5	74.7
OF (%)	100.0	100.0	90.3	0.0	0.0	85.0	100.0	100.0	100.0	100.0	70.0	53.4	74.9
EUF (%)	0.0	0.0	9.7	100.0	100.0	15.0	0.0	0.0	0.0	0.0	30.0	46.6	25.1
PUF (%)	0.0	0.0	9.7	100.0	100.0	15.0	0.0	0.0	0.0	0.0	30.0	46.6	25.1
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	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jun 1976      Lifetime Generation: 194867.3 GW(e).h  
 Date of First Criticality: 18 Apr 1986      Cumulative Energy Availability Factor: 80.1%  
 Date of Grid Connection: 20 May 1986      Cumulative Load Factor: 79.6%  
 Date of Commercial Operation: 19 Sep 1986      Cumulative Unit Capability Factor: 80.3%  
    Cumulative Energy Unavailability Factor: 19.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	Data not provided									
1987	8190.0	1221.0	77.6	77.6	77.6	77.6	76.6	76.6	6860	78.3
1988	6747.2	1221.0	62.6	70.1	62.6	70.1	62.9	69.7	5613	63.9
1989	4698.8	1221.0	44.3	61.5	44.3	61.5	43.9	61.1	4003	45.7
1990	6242.2	1221.0	58.6	60.8	58.6	60.8	58.4	60.4	5276	60.2
1991	8265.2	1221.0	76.3	63.9	76.3	63.9	77.3	63.8	6690	76.4
1992	10104.5	1221.0	94.9	69.0	94.9	69.0	94.2	68.9	8341	95.0
1993	5125.3	1221.0	50.9	66.5	50.9	66.5	47.9	65.9	4621	52.8
1994	6573.9	1221.0	66.8	66.5	66.8	66.5	61.5	65.3	5919	67.6
1995	9070.9	1224.0	84.2	68.5	84.2	68.5	84.6	67.5	7420	84.7
1996	9346.1	1227.0	85.5	70.2	85.5	70.2	86.7	69.4	7548	85.9
1997	9322.7	1244.0	87.2	71.8	87.2	71.8	85.5	70.9	7661	87.4
1998	11084.8	1243.0	100.0	74.1	100.0	74.1	101.8	73.5	8760	100.0
1999	9797.3	1243.0	89.7	75.4	89.7	75.4	90.0	74.8	7857	89.7
2000	9525.3	1243.0	88.2	76.3	88.2	76.3	87.2	75.7	7743	88.1
2001	10083.5	1243.0	91.4	77.3	91.4	77.3	92.6	76.8	8002	91.3
2002	10019.2	1243.0	91.1	78.2	91.1	78.2	92.0	77.8	7981	91.1
2003	8444.4	1243.0	77.7	78.1	77.7	78.1	77.6	77.8	6809	77.7
2004	10662.1	1335.0	94.9	79.1	92.6	79.0	92.0	78.6	8138	92.6
2005	9427.2	1335.0	83.2	79.4	83.2	79.2	80.6	78.7	7284	83.2
2006	9808.2	1314.0	86.0	79.7	86.0	79.6	85.2	79.1	7535	86.0
2007	10957.6	1314.0	95.7	80.5	95.7	80.4	95.2	79.9	8384	95.7
2008	8624.1	1314.0	74.9	80.3	74.9	80.1	74.7	79.6	6577	74.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1987 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					194	
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling	1641			1018		
D. Inspection, maintenance or repair without refuelling	562			223		
E. Testing of plant systems or component:	2			0		
J. Grid limitation, failure or grid unavailability						5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				119	40	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						3
Subtotal	2205	0	0	1360	246	8
Total	2205			1614		

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

System	2008 Hours Lost	1987 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		26
13. Reactor Auxiliary System:		7
14. Safety Systems		23
15. Reactor Cooling System:		10
16. Steam generation system:		32
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries:		14
32. Feedwater and Main Steam System		5
35. All other I&C Systems:		1
41. Main Generator System:		5
42. Electrical Power Supply System:		16
Total	0	143

# US-530 PALO VERDE-3

Operator: AZPSCO (ARIZONA PUBLIC SERVICE CO.)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1317.0 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 2008

Net Energy Production: 10673.3 GW(e).h  
 Energy Availability Factor: 93.3%  
 Load Factor: 92.3%  
 Operating Factor: 93.3%  
 Energy Unavailability Factor: 6.7%  
 Total Off-line Time: 587 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	317.0	924.6	987.6	957.7	986.1	950.6	973.8	975.4	690.2	965.3	954.0	991.0	10673.3
EAF (%)	42.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	78.0	100.0	100.0	100.0	93.3
UCF (%)	42.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	78.0	100.0	100.0	100.0	93.3
LF (%)	32.4	100.9	100.8	101.0	100.6	100.3	99.4	99.5	72.8	98.5	100.6	101.1	92.3
OF (%)	42.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.9	100.0	100.0	100.0	93.3
EUF (%)	57.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	0.0	0.0	0.0	6.7
PUF (%)	57.5	0.0	0.0	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	22.0	0.0	0.0	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Jun 1976      Lifetime Generation: 187454.0 GW(e).h  
 Date of First Criticality: 25 Oct 1987      Cumulative Energy Availability Factor: 82.9%  
 Date of Grid Connection: 28 Nov 1987      Cumulative Load Factor: 82.2%  
 Date of Commercial Operation: 08 Jan 1988      Cumulative Unit Capability Factor: 83.2%  
    Cumulative Energy Unavailability Factor: 17.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	10035.5	1221.0	94.9	94.9	94.9	94.9	95.4	95.4	8177	94.9
1989	1328.0	1221.0	9.0	51.6	9.0	51.6	12.4	53.6	1096	12.5
1990	9636.0	1221.0	91.6	65.0	91.6	65.0	90.1	65.8	8048	91.9
1991	7518.5	1221.0	75.3	67.6	70.8	66.5	70.3	66.9	6272	71.6
1992	8386.2	1221.0	78.7	69.8	78.7	68.9	78.2	69.2	6923	78.8
1993	9393.9	1221.0	90.1	73.2	90.1	72.5	87.8	72.3	7898	90.2
1994	6824.5	1221.0	66.4	72.2	66.4	71.6	63.8	71.1	5920	67.6
1995	9386.8	1225.0	86.6	74.0	86.6	73.5	87.4	73.1	7628	87.1
1996	10789.6	1230.0	99.5	76.9	99.0	76.3	99.9	76.1	8699	99.0
1997	9456.1	1247.0	89.1	78.1	89.1	77.6	86.5	77.2	7820	89.3
1998	9600.9	1247.0	89.3	79.2	89.3	78.7	87.9	78.2	7835	89.4
1999	10956.5	1247.0	100.0	80.9	100.0	80.5	100.3	80.1	8760	100.0
2000	9888.7	1247.0	89.9	81.6	89.9	81.3	90.3	80.9	7898	89.9
2001	9170.4	1247.0	85.0	81.9	85.0	81.5	83.9	81.1	7439	84.9
2002	11137.7	1247.0	100.0	83.1	100.0	82.8	102.0	82.5	8760	100.0
2003	9554.7	1247.0	88.0	83.4	88.0	83.1	87.5	82.8	7712	88.0
2004	8223.3	1247.0	78.4	83.1	76.6	82.7	75.1	82.3	6729	76.6
2005	9164.0	1247.0	85.3	83.2	85.3	82.9	83.9	82.4	7471	85.3
2006	9335.8	1247.0	87.1	83.4	87.1	83.1	85.5	82.6	7625	87.0
2007	6993.7	1247.0	67.4	82.6	67.4	82.3	64.0	81.7	5903	67.4
2008	10673.3	1317.0	93.3	83.2	93.3	82.9	92.3	82.2	8197	93.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		158			153	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	406			1099		
D. Inspection, maintenance or repair without refuelling	21			128	9	
E. Testing of plant systems or component:	0			5		
H. Nuclear regulatory requirement					3	
J. Grid limitation, failure or grid unavailability						8
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					22	19
Subtotal	427	158	0	1232	189	27
Total		585			1448	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems	98	4
13. Reactor Auxiliary Systems		5
14. Safety Systems		20
16. Steam generation system:	50	1
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries	10	37
32. Feedwater and Main Steam System		6
41. Main Generator System:		9
42. Electrical Power Supply System:		32
Total	158	115

## US-277 PEACH BOTTOM-2

**Operator:** EXELON (Exelon Generation)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1112.0 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 2008

**Net Energy Production:** 8750.0 GW(e).h  
**Energy Availability Factor:** 90.1%  
**Load Factor:** 89.6%  
**Operating Factor:** 90.1%  
**Energy Unavailability Factor:** 9.9%  
**Total Off-line Time:** 870 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	841.6	798.9	852.3	819.3	835.0	804.5	801.9	734.7	294.5	277.9	831.5	857.9	8750.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	46.1	35.4	100.0	100.0	90.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	46.1	35.4	100.0	100.0	90.1
<b>LF (%)</b>	101.7	103.2	103.2	102.3	100.9	100.5	96.9	88.8	36.8	33.6	103.7	103.7	89.6
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	46.0	35.3	100.0	100.0	90.1
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.9	64.6	0.0	0.0	9.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.9	64.6	0.0	0.0	9.9
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	31 Jan 1968	<b>Lifetime Generation:</b>	231165.8 GW(e).h
<b>Date of First Criticality:</b>	16 Sep 1973	<b>Cumulative Energy Availability Factor:</b>	73.5%
<b>Date of Grid Connection:</b>	18 Feb 1974	<b>Cumulative Load Factor:</b>	70.9%
<b>Date of Commercial Operation:</b>	05 Jul 1974	<b>Cumulative Unit Capability Factor:</b>	73.5%
		<b>Cumulative Energy Unavailability Factor:</b>	26.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	3659.4	1053.0	90.5	90.5	90.5	90.5	78.9	78.9	4000	90.6
1975	5082.5	1051.0	55.3	67.1	55.3	67.1	55.2	63.1	6638	75.8
1976	5580.4	1051.0	60.5	64.4	60.5	64.4	60.4	62.1	5998	68.3
1977	4051.6	1051.0	44.0	58.6	44.0	58.6	44.0	56.9	4836	55.2
1978	6793.6	1051.0	73.8	62.0	73.8	62.0	73.8	60.7	7299	83.3
1979	8574.4	1051.0	92.9	67.6	92.9	67.6	93.1	66.6	8295	94.7
1980	4372.6	1051.0	49.9	64.9	49.9	64.9	47.4	63.6	4529	51.6
1981	6635.3	1051.0	78.5	66.7	78.5	66.7	72.1	64.7	6938	79.2
1982	4816.8	1051.0	56.5	65.5	56.5	65.5	52.3	63.3	5089	58.1
1983	4481.1	1051.0	49.6	63.8	49.0	63.8	48.7	61.7	4461	50.9
1984	2465.8	1051.0	28.9	60.5	28.9	60.4	26.7	58.4	2544	29.0
1985	2378.2	1051.0	28.7	57.7	28.7	57.7	25.8	55.6	2570	29.3
1986	6896.6	1051.0	79.8	59.5	79.8	59.4	74.9	57.1	7010	80.0
1987	1599.9	1051.0	16.5	56.3	16.5	56.3	17.4	54.2	1724	19.7
1988	0.0	1051.0	0.0	52.4	0.0	52.4	0.0	50.4	0	0.0
1989	3880.9	1051.0	52.3	52.4	52.3	52.4	42.2	49.9	4735	54.1
1990	6699.8	1055.0	78.9	54.0	78.9	54.0	72.5	51.3	6977	79.6
1991	5121.0	1055.0	58.8	54.3	58.8	54.3	55.4	51.5	5277	60.2
1992	5677.9	1055.0	64.9	54.9	64.9	54.8	61.3	52.0	5811	66.2
1993	7704.1	1053.0	85.9	56.5	85.9	56.4	83.5	53.6	7571	86.4
1994	7450.7	1055.0	88.8	58.0	88.8	58.0	80.6	55.0	7783	88.8
1995	9363.4	1093.0	98.2	60.0	98.2	60.0	97.8	57.0	8598	98.2
1996	7660.6	1093.0	93.1	61.5	93.1	61.5	79.8	58.1	8176	93.1
1997	9570.3	1093.0	98.9	63.1	98.9	63.1	100.0	59.9	8663	98.9
1998	7658.8	1093.0	90.4	64.3	90.4	64.3	80.0	60.8	7923	90.4
1999	9462.3	1093.0	98.6	65.7	98.6	65.7	98.8	62.3	8635	98.6
2000	8523.0	1093.0	93.0	66.7	93.0	66.7	88.8	63.3	8169	93.0
2001	9369.2	1093.0	97.8	67.9	97.8	67.9	97.9	64.6	8563	97.8
2002	8838.9	1093.0	93.0	68.8	93.0	68.8	92.3	65.6	8149	93.0
2003	9265.8	1112.0	96.3	69.8	96.3	69.8	94.9	66.7	8430	96.2
2004	8886.1	1112.0	91.8	70.5	91.8	70.5	91.0	67.5	8066	91.8
2005	9615.1	1112.0	97.8	71.4	97.8	71.4	98.7	68.5	8569	97.8
2006	9088.3	1112.0	93.3	72.1	93.3	72.1	93.3	69.3	8172	93.3
2007	9867.9	1112.0	100.0	73.0	100.0	73.0	101.6	70.3	8737	100.0
2008	8750.0	1112.0	90.1	73.5	90.1	73.5	89.6	70.9	7914	90.1



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					409	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	868			1275		
D. Inspection, maintenance or repair without refuelling				229	0	
E. Testing of plant systems or component				5	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirement				115	43	12
J. Grid limitation, failure or grid unavailability					5	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				33	7	1
L. Human factor related					0	
Subtotal	868	0	0	1657	469	13
Total	868			2139		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		22
13. Reactor Auxiliary System:		16
14. Safety Systems		46
15. Reactor Cooling System:		105
31. Turbine and auxiliaries		50
32. Feedwater and Main Steam System		30
35. All other I&C Systems		1
41. Main Generator System:		7
42. Electrical Power Supply System:		53
XX. Miscellaneous Systems		6
Total	0	336

## US-278 PEACH BOTTOM-3

**Operator:** EXELON (Exelon Generation)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1112.0 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 2008

**Net Energy Production:** 9830.5 GW(e).h  
**Energy Availability Factor:** 99.4%  
**Load Factor:** 100.6%  
**Operating Factor:** 99.4%  
**Energy Unavailability Factor:** 0.6%  
**Total Off-line Time:** 55 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	850.7	678.7	849.1	820.8	836.8	811.5	833.3	836.0	804.1	841.2	820.5	847.7	9830.5
<b>EAF (%)</b>	100.0	92.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4
<b>UCF (%)</b>	100.0	92.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4
<b>LF (%)</b>	102.8	87.7	102.8	102.5	101.1	101.4	100.7	101.0	100.4	101.7	102.3	102.5	100.6
<b>OF (%)</b>	100.0	92.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4
<b>EUF (%)</b>	0.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
<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	7.8	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 31 Jan 1968  
**Date of First Criticality:** 07 Aug 1974  
**Date of Grid Connection:** 01 Sep 1974  
**Date of Commercial Operation:** 23 Dec 1974

**Lifetime Generation:** 229928.4 GW(e).h  
**Cumulative Energy Availability Factor:** 74.0%  
**Cumulative Load Factor:** 72.3%  
**Cumulative Unit Capability Factor:** 74.1%  
**Cumulative Energy Unavailability Factor:** 26.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	396.1	1073.0	74.9	74.9	74.9	74.9	51.4	51.4	558	75.0
1975	5282.4	1035.0	58.2	59.5	58.2	59.5	58.3	57.7	7520	85.8
1976	6056.8	1035.0	66.7	62.9	66.7	62.9	66.6	62.0	6829	77.7
1977	4787.8	1035.0	52.8	59.7	52.8	59.7	52.8	59.0	5450	62.2
1978	6973.6	1035.0	76.9	63.9	76.9	63.9	76.9	63.4	7412	84.6
1979	6110.4	1035.0	67.2	64.5	67.2	64.5	67.4	64.2	6500	74.2
1980	7233.4	1035.0	80.1	67.1	79.7	67.0	79.6	66.7	7089	80.7
1981	3171.1	1035.0	33.0	62.3	33.0	62.2	35.0	62.2	3201	36.5
1982	8532.3	1035.0	95.3	66.4	95.3	66.3	94.1	66.2	8372	95.6
1983	2465.7	1035.0	27.5	62.1	27.1	62.0	27.2	61.9	2714	31.0
1984	7445.5	1035.0	86.2	64.5	85.2	64.3	81.9	63.9	7545	85.9
1985	3320.8	1035.0	45.1	62.8	45.1	62.6	36.6	61.4	3988	45.5
1986	4858.8	1035.0	60.9	62.6	60.9	62.5	53.6	60.8	5542	63.3
1987	1507.7	1035.0	14.4	58.9	14.4	58.8	16.6	57.4	1658	18.9
1988	0.0	1035.0	0.0	54.7	0.0	54.6	0.0	53.3	0	0.0
1989	247.3	1035.0	0.1	51.1	0.1	51.0	2.7	50.0	472	5.4
1990	7534.1	1035.0	87.1	53.3	87.1	53.2	83.1	52.0	7684	87.7
1991	5118.9	1035.0	59.1	53.7	57.3	53.5	56.5	52.3	5212	59.5
1992	7180.9	1035.0	83.6	55.3	83.6	55.1	79.0	53.8	7391	84.1
1993	6314.0	1035.0	73.9	56.3	73.9	56.1	69.6	54.6	6594	75.3
1994	8867.4	1035.0	97.9	58.4	97.9	58.2	97.8	56.7	8588	98.0
1995	7172.5	1049.0	90.1	59.9	90.1	59.7	78.0	57.8	7929	90.5
1996	9424.7	1093.0	98.2	61.7	98.2	61.6	98.2	59.7	8627	98.2
1997	7566.6	1093.0	90.3	63.0	90.3	62.9	79.0	60.6	7909	90.3
1998	8823.6	1093.0	93.3	64.4	93.3	64.2	92.2	61.9	8172	93.3
1999	8558.6	1093.0	92.5	65.5	92.5	65.4	89.4	63.1	8100	92.5
2000	9556.8	1093.0	99.3	66.9	99.3	66.7	99.5	64.6	8722	99.3
2001	8524.4	1093.0	93.1	67.9	93.1	67.8	89.0	65.5	8153	93.1
2002	9647.4	1093.0	99.8	69.1	99.8	68.9	100.8	66.8	8740	99.8
2003	8937.8	1112.0	92.4	69.9	92.4	69.8	92.9	67.7	8089	92.3
2004	9989.1	1112.0	100.0	71.0	100.0	70.8	102.3	69.0	8784	100.0
2005	8848.9	1112.0	92.5	71.7	92.5	71.6	90.8	69.7	8105	92.5
2006	9912.7	1112.0	100.0	72.6	100.0	72.5	101.8	70.7	8760	100.0
2007	9030.8	1112.0	93.7	73.3	93.7	73.2	92.7	71.4	8207	93.7
2008	9830.5	1112.0	99.4	74.1	99.4	74.0	100.6	72.3	8729	99.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		54		8	349	4
B. Refuelling without a maintenance outage					17	
C. Inspection, maintenance or repair combined with refuelling				1337		
D. Inspection, maintenance or repair without refuelling				92		
E. Testing of plant systems or component				16	1	
H. Nuclear regulatory requirement					188	6
J. Grid limitation, failure or grid unavailability					10	2
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				23	0	4
Subtotal	0	54	0	1476	565	16
Total		54			2057	

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		26
13. Reactor Auxiliary System:	54	11
14. Safety Systems		43
15. Reactor Cooling System:		108
31. Turbine and auxiliaries		47
32. Feedwater and Main Steam System		45
33. Circulating Water System		2
41. Main Generator System:		19
42. Electrical Power Supply System:		51
Total	54	352

**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  
at the beginning of 2008: 1245.0 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 2008**

Net Energy Production: 10680.6 GW(e).h

Energy Availability Factor: 97.7%

Load Factor: 97.7%

Operating Factor: 97.7%

Energy Unavailability Factor: 2.3%

Total Off-line Time: 204 hours

**3. 2008 Monthly Performance Data**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	951.6	891.2	886.9	598.1	940.4	880.2	921.5	928.6	890.7	940.4	914.2	937.0	10680.6
EAF (%)	100.0	100.0	100.0	71.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.7
UCF (%)	100.0	100.0	100.0	71.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.7
LF (%)	102.7	102.8	95.9	66.7	101.5	98.2	99.5	100.2	99.4	101.5	101.8	101.2	97.7
OF (%)	100.0	100.0	100.0	71.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.7
EUF (%)	0.0	0.0	0.0	28.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
PUF (%)	0.0	0.0	0.0	28.3	0.0	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. 2008 Summary of Operation****5. Historical Summary**

Date of Construction Start: 03 May 1977      Lifetime Generation: 171503.9 GW(e).h

Date of First Criticality: 06 Jun 1986      Cumulative Energy Availability Factor: 80.2%

Date of Grid Connection: 19 Dec 1986      Cumulative Load Factor: 78.1%

Date of Commercial Operation: 18 Nov 1987      Cumulative Unit Capability Factor: 80.2%

   Cumulative Energy Unavailability Factor: 19.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	Data not provided									
1988	7233.8	1203.0	76.3	76.3	76.3	76.3	68.4	68.4	6664	75.9
1989	5357.6	1141.0	53.4	65.2	53.4	65.2	53.6	61.2	4776	54.5
1990	6638.9	1141.0	65.3	65.2	65.3	65.2	66.4	62.9	5723	65.3
1991	8975.7	1166.0	90.7	71.6	90.7	71.6	87.9	69.2	7949	90.7
1992	7168.6	1166.0	72.6	71.8	72.6	71.8	70.0	69.3	6383	72.7
1993	3973.2	1166.0	43.9	67.2	43.9	67.2	38.9	64.3	3853	44.0
1994	4591.9	1166.0	47.3	64.3	47.3	64.3	45.0	61.5	4151	47.4
1995	9112.1	1166.0	93.4	67.9	93.4	67.9	89.2	65.0	8174	93.3
1996	7482.0	1164.0	75.9	68.8	75.9	68.8	73.2	65.9	6673	76.0
1997	8151.8	1160.0	81.9	70.1	81.9	70.1	80.2	67.3	7178	81.9
1998	10188.9	1160.0	99.1	72.8	99.1	72.8	100.3	70.3	8684	99.1
1999	9124.9	1160.0	89.6	74.2	89.6	74.2	89.8	71.9	7850	89.6
2000	10085.7	1191.0	96.9	76.0	96.9	76.0	96.4	73.8	8506	96.8
2001	7781.8	1241.0	77.9	76.1	77.9	76.1	71.8	73.7	6708	76.6
2002	9974.8	1235.0	93.6	77.3	93.6	77.3	92.2	75.0	8196	93.6
2003	8553.2	1235.0	82.4	77.7	82.4	77.7	79.1	75.3	7217	82.4
2004	10227.3	1235.0	95.4	78.7	95.4	78.7	94.3	76.4	8378	95.4
2005	7667.5	1235.0	72.7	78.4	72.7	78.4	70.9	76.1	6363	72.6
2006	10475.4	1235.0	97.3	79.4	97.3	79.4	96.8	77.2	8521	97.3
2007	8058.2	1245.0	76.8	79.3	76.8	79.3	73.9	77.1	6704	76.5
2008	10680.6	1245.0	97.7	80.2	97.7	80.2	97.7	78.1	8580	97.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					474	
B. Refuelling without a maintenance					17	
C. Inspection, maintenance or repair combined with refuelling				1041		
D. Inspection, maintenance or repair without refuelling	203			192		
E. Testing of plant systems or component				0		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					7	
Z. Others					8	
Subtotal	203	0	0	1233	506	0
Total	203			1739		

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		41
13. Reactor Auxiliary System:		17
14. Safety Systems		0
15. Reactor Cooling System:		78
31. Turbine and auxiliaries		62
32. Feedwater and Main Steam System		14
33. Circulating Water System		11
35. All other I&C Systems		7
41. Main Generator System:		33
42. Electrical Power Supply System:		59
XX. Miscellaneous Systems		124
Total	0	446

# US-293 PILGRIM-1

**Operator:** ENTERGY (ENTERGY NUCLEAR)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 685.0 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 2008

**Net Energy Production:** 5869.0 GW(e).h  
**Energy Availability Factor:** 98.6%  
**Load Factor:** 97.5%  
**Operating Factor:** 98.5%  
**Energy Unavailability Factor:** 1.4%  
**Total Off-line Time:** 128 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	511.7	478.6	510.5	448.7	506.8	484.2	507.5	496.8	487.8	502.7	492.4	441.3	5869.0
<b>EAF (%)</b>	100.0	100.0	100.0	93.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.2	98.6
<b>UCF (%)</b>	100.0	100.0	100.0	93.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5
<b>LF (%)</b>	100.4	100.4	100.3	91.0	99.5	98.2	99.6	97.5	98.9	98.6	99.7	86.6	97.5
<b>OF (%)</b>	100.0	100.0	100.0	93.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.1	98.5
<b>EUF (%)</b>	0.0	0.0	0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8	1.4
<b>PUF (%)</b>	0.0	0.0	0.0	6.5	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	10.8	0.9

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	26 Aug 1968	<b>Lifetime Generation:</b>	140490.5 GW(e).h
<b>Date of First Criticality:</b>	16 Jun 1972	<b>Cumulative Energy Availability Factor:</b>	70.0%
<b>Date of Grid Connection:</b>	19 Jul 1972	<b>Cumulative Load Factor:</b>	65.9%
<b>Date of Commercial Operation:</b>	01 Dec 1972	<b>Cumulative Unit Capability Factor:</b>	70.3%
		<b>Cumulative Energy Unavailability Factor:</b>	30.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	304.5	678.0	100.0	100.0	100.0	100.0	59.6	59.6	511	68.7
1973	4074.2	655.0	88.1	89.1	88.1	89.1	71.0	70.1	7574	86.5
1974	1973.1	670.0	39.2	64.9	39.2	64.9	33.6	52.4	3435	39.2
1975	2587.3	668.0	44.1	58.1	44.1	58.1	44.2	49.7	6239	71.2
1976	2415.5	665.0	41.1	54.0	41.1	54.0	41.4	47.7	5330	60.7
1977	2652.2	670.0	45.2	52.2	45.2	52.2	45.2	47.2	5379	61.4
1978	4376.7	669.0	74.8	55.9	74.8	55.9	74.7	51.7	7276	83.1
1979	4844.6	670.0	82.5	59.7	82.5	59.7	82.5	56.1	7828	89.4
1980	3044.1	670.0	56.5	59.3	56.5	59.3	51.7	55.5	4952	56.4
1981	3444.1	670.0	66.0	60.0	66.0	60.0	58.7	55.9	5767	65.8
1982	3287.1	670.0	64.1	60.4	64.1	60.4	56.0	55.9	5597	63.9
1983	4711.9	670.0	87.3	62.9	87.3	62.9	80.3	58.1	7640	87.2
1984	3.5	669.0	1.4	57.8	1.4	57.8	0.1	53.3	34	0.4
1985	4951.0	667.0	93.3	60.5	91.5	60.3	84.6	55.7	8013	91.5
1986	1027.5	670.0	18.9	57.5	18.9	57.4	17.5	53.0	1646	18.8
1987	0.0	670.0	0.0	53.7	0.0	53.6	0.0	49.4	0	0.0
1988	0.0	670.0	0.0	50.3	0.0	50.2	0.0	46.4	0	0.0
1989	1707.8	670.0	56.3	50.7	56.3	50.6	29.1	45.3	4919	56.2
1990	4243.2	670.0	77.5	52.2	77.5	52.1	72.3	46.8	6784	77.4
1991	3424.5	670.0	69.9	53.1	63.7	52.7	58.3	47.4	5572	63.6
1992	4742.0	670.0	84.3	54.7	84.3	54.3	80.6	49.1	7400	84.2
1993	4340.8	670.0	79.1	55.8	78.6	55.4	74.0	50.3	6880	78.5
1994	3824.1	670.0	69.4	56.4	69.4	56.1	65.2	51.0	6069	69.3
1995	4485.8	670.0	79.5	57.4	79.5	57.1	76.4	52.1	6962	79.5
1996	5324.3	670.0	95.0	59.0	95.0	58.7	90.5	53.7	8345	95.0
1997	4310.4	670.0	78.1	59.8	78.1	59.4	73.4	54.4	6840	78.1
1998	5698.4	670.0	100.0	61.3	100.0	61.0	97.1	56.1	8760	100.0
1999	4473.3	670.0	81.6	62.1	81.6	61.7	76.2	56.8	7141	81.5
2000	5512.3	670.0	96.3	63.3	96.3	63.0	93.7	58.1	8454	96.2
2001	5144.0	653.0	90.0	64.2	90.0	63.9	89.0	59.2	7884	90.0
2002	5769.1	653.0	100.0	65.3	100.0	65.1	100.9	60.5	8760	100.0
2003	4977.2	684.0	85.8	66.0	85.8	65.7	84.7	61.3	7548	86.2
2004	5939.3	684.0	99.3	67.1	99.3	66.8	98.9	62.5	8721	99.3
2005	5474.0	685.0	93.2	67.9	93.2	67.6	91.2	63.4	8166	93.2
2006	5829.2	685.0	99.1	68.8	99.1	68.6	97.1	64.4	8684	99.1
2007	5119.8	685.0	88.8	69.4	88.8	69.2	85.3	65.0	7774	88.7
2008	5869.0	685.0	99.5	70.3	98.6	70.0	97.5	65.9	8656	98.5



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					578	
B. Refuelling without a maintenance					12	
C. Inspection, maintenance or repair combined with refuelling				1369	2	
D. Inspection, maintenance or repair without refuelling	46			149	0	
E. Testing of plant systems or component				53	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling					0	
H. Nuclear regulatory requirement				40	5	144
J. Grid limitation, failure or grid unavailability						20
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					52	5
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			80			
Subtotal	46	0	80	1611	650	169
Total		126			2430	

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		32
13. Reactor Auxiliary Systems		104
14. Safety Systems		12
15. Reactor Cooling System		144
31. Turbine and auxiliaries		62
32. Feedwater and Main Steam System		53
35. All other I&C Systems		2
41. Main Generator System		43
42. Electrical Power Supply System		59
XX. Miscellaneous Systems		11
Total	0	529

## US-266 POINT BEACH-1

**Operator:** WEP (WISCONSIN ELECTRIC POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 512.0 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 2008

**Net Energy Production:** 3737.0 GW(e).h  
**Energy Availability Factor:** 83.9%  
**Load Factor:** 83.1%  
**Operating Factor:** 83.8%  
**Energy Unavailability Factor:** 16.1%  
**Total Off-line Time:** 1419 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	193.4	305.0	382.5	371.2	376.5	368.4	380.7	371.4	364.8	46.3	194.4	382.5	3737.0
<b>EAF (%)</b>	51.0	86.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.5	57.7	100.0	83.9
<b>UCF (%)</b>	51.0	86.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.5	57.7	100.0	83.9
<b>LF (%)</b>	50.8	85.6	100.6	100.7	98.8	99.9	99.9	97.5	98.9	12.2	52.7	100.4	83.1
<b>OF (%)</b>	50.9	86.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.4	57.6	100.0	83.8
<b>EUF (%)</b>	49.0	13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.5	42.3	0.0	16.1
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.5	42.3	0.0	10.9
<b>UCLF (%)</b>	49.0	13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 19 Jul 1967  
**Date of First Criticality:** 02 Nov 1970  
**Date of Grid Connection:** 06 Nov 1970  
**Date of Commercial Operation:** 21 Dec 1970

**Lifetime Generation:** 129546.7 GW(e).h  
**Cumulative Energy Availability Factor:** 82.7%  
**Cumulative Load Factor:** 78.1%  
**Cumulative Unit Capability Factor:** 83.1%  
**Cumulative Energy Unavailability Factor:** 17.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1970	0.0	498.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1971	3446.2	524.0	100.0	100.0	100.0	100.0	75.1	69.2	7699	87.9
1972	3085.5	524.0	100.0	100.0	100.0	100.0	67.0	68.2	6349	72.3
1973	2742.3	497.0	67.6	89.9	67.6	89.9	63.0	66.5	6867	78.4
1974	3144.3	497.0	81.4	87.9	81.4	87.9	72.2	67.9	7136	81.5
1975	2924.9	480.0	69.5	84.4	69.5	84.4	69.6	68.2	6297	71.9
1976	3392.5	492.0	78.4	83.5	78.4	83.5	78.5	69.9	7239	82.4
1977	3687.1	495.0	85.1	83.7	85.1	83.7	85.0	72.0	7733	88.3
1978	3794.5	495.0	87.5	84.2	87.5	84.2	87.5	73.9	7864	89.8
1979	3059.6	495.0	70.6	82.7	70.6	82.7	70.6	73.5	6455	73.7
1980	2479.3	495.0	91.0	83.5	77.0	82.1	57.0	71.9	6739	76.7
1981	2614.9	495.0	78.3	83.0	78.3	81.8	60.3	70.9	6834	78.0
1982	2701.7	495.0	81.5	82.9	81.5	81.8	62.3	70.2	7134	81.4
1983	2384.9	495.0	74.3	82.3	74.3	81.2	55.0	69.0	6498	74.2
1984	3109.2	485.0	72.6	81.6	72.6	80.6	73.0	69.3	6379	72.6
1985	3354.2	485.0	78.6	81.4	78.6	80.5	78.9	69.9	6917	79.0
1986	3770.1	485.0	88.7	81.8	88.7	81.0	88.7	71.0	7786	88.9
1987	3567.1	485.0	83.6	81.9	83.6	81.1	84.0	71.8	7348	83.9
1988	3831.0	485.0	88.5	82.3	88.5	81.5	89.9	72.8	7787	88.6
1989	3606.2	485.0	87.8	82.6	87.8	81.8	84.9	73.4	7706	88.0
1990	3531.7	485.0	83.8	82.6	83.8	81.9	83.1	73.9	7362	84.0
1991	3628.7	485.0	85.7	82.8	85.7	82.1	85.4	74.4	7524	85.9
1992	3605.6	485.0	84.1	82.8	84.1	82.2	84.6	74.9	7409	84.3
1993	3804.8	485.0	88.8	83.1	88.8	82.5	89.6	75.5	7799	89.0
1994	3905.1	485.0	92.0	83.5	92.0	82.9	91.9	76.2	8071	92.1
1995	3792.4	485.0	88.5	83.7	88.5	83.1	89.3	76.7	7768	88.7
1996	4003.3	485.0	93.0	84.0	93.0	83.5	94.0	77.3	8173	93.0
1997	853.5	485.0	21.3	81.7	21.3	81.2	20.1	75.2	1872	21.4
1998	2584.2	485.0	62.7	81.1	62.7	80.6	60.8	74.7	5489	62.7
1999	3489.3	489.0	80.0	81.0	80.0	80.5	81.4	75.0	7070	80.7
2000	4134.6	510.0	96.1	81.5	95.6	81.1	92.3	75.6	8391	95.5
2001	3702.1	510.0	87.0	81.7	87.0	81.3	82.9	75.8	7611	86.9
2002	3975.8	510.0	91.0	82.0	91.0	81.6	89.0	76.2	7964	90.9
2003	4343.0	516.0	97.5	82.5	97.5	82.1	96.2	76.9	8538	97.5
2004	3631.0	516.0	81.9	82.5	81.9	82.1	80.1	77.0	7186	81.8
2005	3641.0	512.0	82.6	82.5	82.6	82.1	81.2	77.1	7232	82.6
2006	4465.6	512.0	100.0	83.0	100.0	82.6	99.6	77.7	8760	100.0
2007	3822.3	512.0	86.6	83.1	86.6	82.7	85.2	77.9	7582	86.6
2008	3737.0	512.0	83.9	83.1	83.9	82.7	83.1	78.1	7365	83.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		460			139	
B. Refuelling without a maintenance outage					1	
C. Inspection, maintenance or repair combined with refuelling	956			1085		
D. Inspection, maintenance or repair without refuelling				57		
E. Testing of plant systems or component				2		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirement						32
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	184	1
Subtotal	956	460	0	1145	324	34
Total		1416			1503	

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		0
15. Reactor Cooling System		9
16. Steam generation system		62
31. Turbine and auxiliaries		16
32. Feedwater and Main Steam System		24
33. Circulating Water System		1
41. Main Generator System		8
42. Electrical Power Supply System	460	2
Total	460	123

## US-301 POINT BEACH-2

**Operator:** WEP (WISCONSIN ELECTRIC POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 514.0 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 2008

**Net Energy Production:** 4075.9 GW(e).h  
**Energy Availability Factor:** 90.0%  
**Load Factor:** 90.3%  
**Operating Factor:** 90.0%  
**Energy Unavailability Factor:** 10.0%  
**Total Off-line Time:** 880 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	387.8	362.7	387.5	57.7	225.4	376.6	386.0	376.8	369.4	385.5	375.9	384.5	4075.9
<b>EAF (%)</b>	100.0	100.0	100.0	16.0	63.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0
<b>UCF (%)</b>	100.0	100.0	100.0	16.0	63.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0
<b>LF (%)</b>	101.4	101.4	101.5	15.6	58.9	101.8	100.9	98.5	99.8	100.8	101.4	100.5	90.3
<b>OF (%)</b>	100.0	100.0	100.0	16.0	63.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0
<b>EUF (%)</b>	0.0	0.0	0.0	84.0	36.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
<b>PUF (%)</b>	0.0	0.0	0.0	84.0	36.9	0.0	0.0	0.0	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	0.0	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 25 Jul 1968  
**Date of First Criticality:** 30 May 1972  
**Date of Grid Connection:** 02 Aug 1972  
**Date of Commercial Operation:** 01 Oct 1972

**Lifetime Generation:** 128798.2 GW(e).h  
**Cumulative Energy Availability Factor:** 84.5%  
**Cumulative Load Factor:** 82.2%  
**Cumulative Unit Capability Factor:** 84.5%  
**Cumulative Energy Unavailability Factor:** 15.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	140.4	288.0	100.0	100.0	100.0	100.0	84.8	84.8	1799	81.5
1973	2991.0	497.0	80.2	80.9	80.2	80.9	68.7	69.3	8192	93.5
1974	3179.3	497.0	81.0	81.0	81.0	81.0	73.0	71.1	7100	81.1
1975	3741.4	485.0	87.9	83.2	87.9	83.2	88.1	76.6	8224	93.9
1976	3749.2	491.0	86.8	84.1	86.8	84.1	86.9	79.2	7959	90.6
1977	3622.3	495.0	83.5	84.0	83.5	84.0	83.5	80.0	7496	85.6
1978	3858.9	495.0	89.0	84.8	89.0	84.8	89.0	81.5	8039	91.8
1979	3707.5	495.0	85.5	84.9	85.5	84.9	85.5	82.1	7728	88.2
1980	3587.9	495.0	88.0	85.3	88.0	85.3	82.5	82.1	7569	86.2
1981	3720.3	495.0	89.9	85.8	89.9	85.8	85.8	82.5	7757	88.6
1982	3605.4	495.0	88.2	86.1	88.2	86.1	83.1	82.6	7595	86.7
1983	3016.3	495.0	74.5	85.0	74.5	85.0	69.6	81.4	6245	71.3
1984	3512.4	495.0	86.0	85.1	86.0	85.1	80.8	81.4	7405	84.3
1985	3603.1	485.0	86.8	85.2	86.8	85.2	84.8	81.6	7491	85.5
1986	3417.6	485.0	82.1	85.0	82.1	85.0	80.4	81.5	7186	82.0
1987	3606.1	485.0	85.9	85.1	85.5	85.0	84.9	81.8	7478	85.4
1988	3718.7	485.0	88.0	85.2	88.0	85.2	87.3	82.1	7626	86.8
1989	3485.1	485.0	82.9	85.1	82.9	85.1	82.0	82.1	7107	81.1
1990	3793.5	485.0	89.1	85.3	89.1	85.3	89.3	82.5	7713	88.0
1991	3689.2	485.0	87.6	85.4	87.6	85.4	86.8	82.7	7569	86.4
1992	3668.2	485.0	86.6	85.5	86.6	85.5	86.1	82.9	7492	85.3
1993	3844.5	485.0	90.9	85.8	90.9	85.7	90.5	83.2	7883	90.0
1994	3752.3	485.0	90.3	86.0	90.3	85.9	88.3	83.5	7827	89.3
1995	3386.0	485.0	83.4	85.9	83.4	85.8	79.7	83.3	7158	81.7
1996	2950.3	485.0	78.0	85.5	78.0	85.5	69.3	82.7	6653	75.7
1997	825.5	485.0	21.4	83.0	21.4	83.0	19.4	80.2	1788	20.4
1998	3123.8	485.0	75.5	82.7	75.5	82.7	73.5	80.0	6609	75.4
1999	3578.5	498.0	82.6	82.7	82.6	82.7	81.9	80.0	7195	82.1
2000	3527.4	512.0	80.9	82.6	80.9	82.6	78.4	80.0	7094	80.8
2001	4343.0	512.0	98.6	83.2	98.6	83.2	96.8	80.6	8631	98.5
2002	4004.3	512.0	90.7	83.5	90.7	83.4	89.3	80.9	7934	90.6
2003	3713.3	518.0	85.6	83.5	85.6	83.5	81.9	80.9	7469	85.3
2004	4384.9	518.0	97.5	84.0	97.5	84.0	96.4	81.4	8559	97.4
2005	3232.6	514.0	72.6	83.6	72.6	83.6	71.8	81.1	6355	72.5
2006	4094.8	514.0	91.0	83.9	91.0	83.8	90.9	81.4	7972	91.0
2007	4462.2	514.0	100.0	84.3	100.0	84.3	99.1	81.9	8760	100.0
2008	4075.9	514.0	90.0	84.5	90.0	84.5	90.3	82.2	7904	90.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					112	
B. Refuelling without a maintenance					0	
C. Inspection, maintenance or repair combined with refuelling	879			1094		
D. Inspection, maintenance or repair without refuelling				40	0	
E. Testing of plant systems or component				6		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				3		
H. Nuclear regulatory requirement					4	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	40	0
Z. Others					2	
Subtotal	879	0	0	1143	158	0
Total	879			1301		

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		3
12. Reactor I&C Systems		30
14. Safety Systems		0
15. Reactor Cooling System		35
16. Steam generation system		16
31. Turbine and auxiliaries		7
32. Feedwater and Main Steam System		10
42. Electrical Power Supply System		9
Total	0	110

# US-282 PRAIRIE ISLAND-1

**Operator:** NORTHERN (Northern States Power Co.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 551.0 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 2008

**Net Energy Production:** 4059.5 GW(e).h  
**Energy Availability Factor:** 88.6%  
**Load Factor:** 83.9%  
**Operating Factor:** 88.6%  
**Energy Unavailability Factor:** 11.4%  
**Total Off-line Time:** 1004 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	406.2	136.8	74.3	381.9	386.1	370.1	372.2	357.5	380.3	399.8	390.6	403.7	4059.5
<b>EAF (%)</b>	100.0	41.6	28.5	100.0	100.0	100.0	97.9	93.3	100.0	100.0	100.0	100.0	88.6
<b>UCF (%)</b>	100.0	41.6	28.5	100.0	100.0	100.0	97.9	93.3	100.0	100.0	100.0	100.0	88.6
<b>LF (%)</b>	99.1	35.7	18.2	96.3	94.2	93.3	90.8	87.2	95.9	97.5	98.3	98.5	83.9
<b>OF (%)</b>	100.0	41.5	28.5	100.0	100.0	100.0	97.8	93.3	100.0	100.0	100.0	100.0	88.6
<b>EUF (%)</b>	0.0	58.4	71.5	0.0	0.0	0.0	2.1	6.7	0.0	0.0	0.0	0.0	11.4
<b>PUF (%)</b>	0.0	58.4	71.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	2.1	6.7	0.0	0.0	0.0	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. 2008 Summary of Operation



## 5. Historical Summary

**Date of Construction Start:** 25 Jun 1968  
**Date of First Criticality:** 01 Dec 1973  
**Date of Grid Connection:** 04 Dec 1973  
**Date of Commercial Operation:** 16 Dec 1973

**Lifetime Generation:** 134433.3 GW(e).h  
**Cumulative Energy Availability Factor:** 86.1%  
**Cumulative Load Factor:** 85.1%  
**Cumulative Unit Capability Factor:** 86.1%  
**Cumulative Energy Unavailability Factor:** 13.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	7.2	514.0	100.0	100.0	100.0	100.0	2.1	2.1	312	46.4
1974	1452.2	520.0	43.9	47.9	43.9	47.9	31.9	29.8	3848	43.9
1975	3694.2	520.0	81.2	63.9	81.2	63.9	81.1	54.5	7560	86.3
1976	3268.7	520.0	71.5	66.4	71.5	66.4	71.6	60.0	6801	77.4
1977	3714.5	511.0	82.9	70.4	82.9	70.4	83.0	65.6	7453	85.1
1978	3810.7	507.0	85.9	73.4	85.9	73.4	85.8	69.5	8012	91.5
1979	2910.9	503.0	65.8	72.2	65.8	72.2	66.1	68.9	6402	73.1
1980	3105.7	503.0	77.8	73.0	77.8	73.0	70.3	69.1	6863	78.1
1981	3838.6	503.0	88.9	74.9	88.9	74.9	87.1	71.3	7803	89.1
1982	3918.0	503.0	90.9	76.6	90.9	76.6	88.9	73.2	7960	90.9
1983	3888.9	503.0	87.2	77.7	87.2	77.7	88.3	74.7	7621	87.0
1984	4159.4	503.0	94.3	79.2	94.3	79.2	94.1	76.4	8285	94.3
1985	3678.5	503.0	83.4	79.5	83.4	79.5	83.5	77.0	7333	83.7
1986	3819.6	503.0	89.6	80.3	89.6	80.3	86.7	77.8	7870	89.8
1987	3590.3	503.0	82.2	80.4	82.2	80.4	81.5	78.0	7232	82.6
1988	3823.4	503.0	89.3	81.0	89.3	81.0	86.5	78.6	7800	88.8
1989	4392.3	503.0	99.7	82.2	99.7	82.2	99.7	79.9	8737	99.7
1990	3829.7	503.0	81.7	82.1	81.7	82.1	86.9	80.3	7764	88.6
1991	3987.1	505.0	90.5	82.6	90.5	82.6	90.1	80.8	7943	90.7
1992	3497.8	503.0	77.4	82.3	77.4	82.3	79.2	80.7	6844	77.9
1993	4378.0	505.0	96.8	83.0	96.8	83.0	98.9	81.6	8480	96.8
1994	3718.2	513.0	82.8	83.0	82.8	83.0	82.7	81.7	7258	82.9
1995	4519.0	513.0	99.9	83.8	99.9	83.8	100.6	82.6	8752	99.9
1996	3741.6	513.0	92.9	84.2	92.2	84.2	83.0	82.6	7327	83.4
1997	3522.8	513.0	79.5	84.0	79.5	84.0	78.4	82.4	6965	79.5
1998	4209.2	514.0	90.8	84.3	90.8	84.3	93.5	82.8	7948	90.7
1999	4068.8	522.0	87.2	84.4	87.2	84.4	89.0	83.1	7643	87.2
2000	4536.5	522.0	96.7	84.9	96.7	84.8	98.9	83.7	8499	96.8
2001	3641.7	522.0	78.8	84.6	78.8	84.6	79.6	83.5	6890	78.7
2002	4373.2	522.0	94.4	85.0	94.4	85.0	95.6	84.0	8268	94.4
2003	4596.3	522.0	98.4	85.4	98.4	85.4	101.0	84.5	8619	98.4
2004	3602.1	522.0	79.9	85.3	79.9	85.2	78.6	84.3	7017	79.9
2005	4518.4	522.0	96.7	85.6	96.7	85.6	98.8	84.8	8465	96.6
2006	4103.2	523.0	88.9	85.7	88.9	85.7	89.6	85.0	7785	88.9
2007	4457.1	551.0	96.7	86.1	96.7	86.0	92.3	85.2	8472	96.7
2008	4059.5	551.0	88.6	86.1	88.6	86.1	83.9	85.1	7780	88.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1973 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		65			297	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	937			662		
D. Inspection, maintenance or repair without refuelling				87		
E. Testing of plant systems or component				7	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					25	1
Subtotal	937	65	0	756	324	1
Total		1002			1081	

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

System	2008 Hours Lost	1973 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		15
12. Reactor I&C Systems		29
14. Safety Systems		10
15. Reactor Cooling System		7
16. Steam generation system		38
17. Safety I&C Systems (excluding reactor I&C)	65	
31. Turbine and auxiliaries		125
32. Feedwater and Main Steam System		36
35. All other I&C Systems		8
41. Main Generator System		1
42. Electrical Power Supply System		10
XX. Miscellaneous Systems		0
Total	65	279

## US-306 PRAIRIE ISLAND-2

Operator: —

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 545.0 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 2008

Net Energy Production: 4059.4 GW(e).h  
 Energy Availability Factor: 88.4%  
 Load Factor: 84.8%  
 Operating Factor: 88.4%  
 Energy Unavailability Factor: 11.6%  
 Total Off-line Time: 1016 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	404.3	378.3	394.8	380.5	386.6	373.2	384.7	385.8	229.4	0.0	338.3	403.6	4059.4
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.1	0.0	99.3	100.0	88.4
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.1	0.0	99.3	100.0	88.4
LF (%)	99.7	99.7	97.5	97.0	95.4	95.1	94.9	95.1	58.5	0.0	86.1	99.5	84.8
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.1	0.0	99.2	100.0	88.4
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.9	100.0	0.7	0.0	11.6
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.9	100.0	0.7	0.0	11.6
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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	25 Jun 1969	<b>Lifetime Generation:</b>	133449.1 GW(e).h
<b>Date of First Criticality:</b>	17 Dec 1974	<b>Cumulative Energy Availability Factor:</b>	87.9%
<b>Date of Grid Connection:</b>	21 Dec 1974	<b>Cumulative Load Factor:</b>	87.5%
<b>Date of Commercial Operation:</b>	21 Dec 1974	<b>Cumulative Unit Capability Factor:</b>	87.9%
		<b>Cumulative Energy Unavailability Factor:</b>	12.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	7.4	513.0	100.0	100.0	100.0	100.0	5.6	5.6	104	41.3
1975	3176.2	520.0	69.9	70.7	69.9	70.7	69.9	68.1	7035	80.5
1976	2660.6	520.0	58.2	64.6	58.2	64.6	58.2	63.2	6657	75.8
1977	3882.3	511.0	86.7	71.8	86.7	71.8	86.7	70.9	7807	89.1
1978	3924.4	507.0	88.2	75.8	88.2	75.8	88.4	75.2	8126	92.8
1979	4193.0	500.0	94.6	79.4	94.6	79.4	95.7	79.2	8661	98.9
1980	3468.7	500.0	81.5	79.8	81.4	79.8	79.0	79.1	7167	81.6
1981	3092.9	500.0	71.4	78.6	71.4	78.6	70.6	77.9	6292	71.8
1982	3857.7	500.0	90.0	80.0	89.8	80.0	88.1	79.2	7844	89.5
1983	3716.3	500.0	86.5	80.7	86.5	80.7	84.8	79.8	7574	86.5
1984	3906.0	500.0	89.2	81.6	89.2	81.5	88.9	80.7	7830	89.1
1985	3612.5	500.0	92.9	82.6	92.9	82.6	82.5	80.9	7378	84.2
1986	3854.0	500.0	90.6	83.2	90.6	83.2	88.0	81.5	7930	90.5
1987	4462.2	500.0	100.0	84.5	100.0	84.5	101.9	83.0	8760	100.0
1988	3886.2	500.0	88.2	84.8	88.2	84.8	88.5	83.4	7773	88.5
1989	3887.2	500.0	96.9	85.6	96.9	85.6	88.7	83.7	7798	89.0
1990	3803.7	500.0	83.3	85.4	83.3	85.4	86.8	83.9	7602	86.8
1991	4480.4	502.0	100.0	86.3	100.0	86.3	101.8	85.0	8760	100.0
1992	3223.5	500.0	73.5	85.6	73.5	85.6	73.4	84.3	6516	74.2
1993	3746.2	503.0	83.5	85.5	83.5	85.5	85.0	84.4	7338	83.8
1994	4553.0	512.0	99.7	86.2	99.7	86.2	101.5	85.3	8734	99.7
1995	3968.2	512.0	87.5	86.3	87.5	86.2	88.5	85.4	7666	87.5
1996	4485.1	512.0	99.2	86.9	98.6	86.8	99.7	86.1	8653	98.5
1997	3642.9	512.0	82.0	86.6	82.0	86.6	81.2	85.9	7180	82.0
1998	3333.7	512.0	74.8	86.1	74.8	86.1	74.3	85.4	6555	74.8
1999	4597.4	522.0	99.2	86.7	99.2	86.6	100.5	86.0	8690	99.2
2000	4182.3	522.0	89.0	86.8	89.0	86.7	91.2	86.2	7820	89.0
2001	4271.0	522.0	91.7	87.0	91.7	86.9	93.4	86.5	8031	91.7
2002	4296.0	522.0	92.4	87.2	92.4	87.1	93.9	86.7	8082	92.3
2003	4241.0	522.0	92.0	87.3	92.0	87.3	92.7	87.0	8058	92.0
2004	4660.3	522.0	99.5	87.7	99.5	87.7	101.6	87.5	8737	99.5
2005	3848.6	522.0	83.3	87.6	83.3	87.6	84.2	87.4	7296	83.3
2006	4012.4	522.0	87.5	87.6	87.5	87.6	87.7	87.4	7665	87.5
2007	4456.6	545.0	96.9	87.9	96.9	87.9	93.3	87.6	8488	96.9
2008	4059.4	545.0	88.4	87.9	88.4	87.9	84.8	87.5	7768	88.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					221	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1014			582		
D. Inspection, maintenance or repair without refuelling				94		
E. Testing of plant systems or component:				4		
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					16	1
Subtotal	1014	0	0	680	238	1
Total	1014			919		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		43
13. Reactor Auxiliary Systems		3
14. Safety Systems		5
15. Reactor Cooling Systems		37
16. Steam generation systems		6
31. Turbine and auxiliaries		72
32. Feedwater and Main Steam System		3
33. Circulating Water System		2
35. All other I&C Systems		0
41. Main Generator Systems		7
42. Electrical Power Supply Systems		29
Total	0	207

# US-254 QUAD CITIES-1

**Operator:** EXELON (Exelon Generation)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 867.0 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 2008

**Net Energy Production:** 7490.1 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 98.4%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	645.5	565.3	643.5	595.3	640.6	621.0	644.5	644.9	621.8	645.0	580.5	642.3	7490.1
<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>	100.1	93.7	99.9	95.4	99.3	99.5	99.9	100.0	99.6	100.0	92.9	99.6	98.4
<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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	15 Feb 1967	<b>Lifetime Generation:</b>	181051.8 GW(e).h
<b>Date of First Criticality:</b>	18 Oct 1971	<b>Cumulative Energy Availability Factor:</b>	77.0%
<b>Date of Grid Connection:</b>	12 Apr 1972	<b>Cumulative Load Factor:</b>	71.8%
<b>Date of Commercial Operation:</b>	18 Feb 1973	<b>Cumulative Unit Capability Factor:</b>	77.1%
		<b>Cumulative Energy Unavailability Factor:</b>	23.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	4451.0	800.0	87.0	87.0	87.0	87.0	69.4	69.4	6667	83.2
1974	3464.1	800.0	61.4	73.6	61.4	73.6	49.4	59.0	5365	61.2
1975	4413.4	800.0	61.0	69.3	61.0	69.3	63.0	60.3	7531	86.0
1976	3401.7	769.0	50.4	64.6	50.4	64.6	50.4	57.9	5699	64.9
1977	3527.4	769.0	52.4	62.2	52.4	62.2	52.4	56.8	6176	70.5
1978	4782.0	769.0	71.0	63.7	71.0	63.7	71.0	59.1	8315	94.9
1979	4786.5	769.0	71.1	64.7	71.1	64.7	71.1	60.8	7096	81.0
1980	3468.8	769.0	67.4	65.1	66.7	65.0	51.4	59.6	5840	66.5
1981	5726.8	769.0	94.3	68.3	94.3	68.2	85.0	62.4	8244	94.1
1982	3258.0	769.0	68.5	68.3	68.5	68.2	48.4	61.0	5951	67.9
1983	5776.4	769.0	94.7	70.7	94.7	70.6	85.7	63.3	8258	94.3
1984	3358.5	769.0	53.4	69.3	53.4	69.2	49.7	62.2	4687	53.4
1985	6072.3	769.0	94.1	71.2	94.1	71.1	90.1	64.3	8242	94.1
1986	4426.2	769.0	68.9	71.0	68.9	70.9	65.7	64.4	6035	68.9
1987	4456.1	769.0	70.1	70.9	70.1	70.9	66.1	64.5	6141	70.1
1988	5662.0	769.0	93.4	72.3	93.4	72.3	83.8	65.7	8199	93.3
1989	4280.4	769.0	73.4	72.4	73.4	72.4	63.5	65.6	6428	73.4
1990	5345.6	769.0	83.1	73.0	83.1	73.0	79.4	66.4	7276	83.1
1991	3549.5	769.0	56.6	72.1	55.8	72.1	52.7	65.6	4882	55.7
1992	4166.1	769.0	70.1	72.0	70.1	72.0	61.7	65.4	6158	70.1
1993	5042.5	769.0	78.8	72.4	78.8	72.3	74.9	65.9	6902	78.8
1994	1670.2	769.0	28.9	70.4	28.9	70.3	24.8	64.0	2526	28.8
1995	5886.2	769.0	90.6	71.3	90.6	71.2	87.4	65.0	7934	90.6
1996	2680.6	769.0	42.9	70.1	42.9	70.0	39.7	64.0	3769	42.9
1997	5565.5	769.0	88.7	70.8	88.7	70.8	82.6	64.7	7764	88.6
1998	3142.9	769.0	49.1	70.0	49.1	69.9	46.7	64.0	4299	49.1
1999	6337.6	769.0	93.7	70.9	93.7	70.8	94.1	65.1	8210	93.7
2000	6168.1	769.0	93.8	71.7	93.8	71.6	91.3	66.1	8242	93.8
2001	6710.9	769.0	99.2	72.6	99.2	72.6	99.6	67.2	8691	99.2
2002	5709.5	855.0	86.6	73.1	86.6	73.1	84.0	67.8	7564	86.3
2003	6810.2	855.0	92.4	73.8	92.4	73.7	90.9	68.6	8013	91.5
2004	6502.8	855.0	100.0	74.7	100.0	74.7	86.6	69.2	8784	100.0
2005	6281.1	864.0	89.9	75.2	89.9	75.2	83.0	69.7	7875	89.9
2006	6747.3	867.0	93.2	75.8	93.2	75.8	88.8	70.3	8161	93.2
2007	6951.0	867.0	93.7	76.4	93.7	76.3	91.5	71.0	8212	93.7
2008	7490.1	867.0	100.0	77.1	100.0	77.0	98.4	71.8	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					387	
B. Refuelling without a maintenance					69	
C. Inspection, maintenance or repair combined with refuelling				1088		
D. Inspection, maintenance or repair without refuelling				162	3	
E. Testing of plant systems or component:				7	7	
H. Nuclear regulatory requirement					5	1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	45	1
Subtotal	0	0	0	1257	516	2
Total	0			1775		

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		21
13. Reactor Auxiliary System:		3
14. Safety Systems		8
15. Reactor Cooling System:		102
31. Turbine and auxiliaries		72
32. Feedwater and Main Steam System		22
41. Main Generator System:		16
42. Electrical Power Supply System:		36
XX. Miscellaneous Systems		11
Total	0	291



## US-265 QUAD CITIES-2

**Operator:** EXELON (Exelon Generation)  
**Contractor:** GE (GENERAL ELECTRIC CO.)

### 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 867.0 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 2008

**Net Energy Production:** 6734.6 GW(e).h  
**Energy Availability Factor:** 89.4%  
**Load Factor:** 88.4%  
**Operating Factor:** 89.4%  
**Energy Unavailability Factor:** 10.6%  
**Total Off-line Time:** 932 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	644.1	589.9	35.8	614.6	646.6	626.8	646.0	639.9	621.3	639.5	627.1	402.9	6734.6
<b>EAF (%)</b>	100.0	100.0	9.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	65.0	89.4
<b>UCF (%)</b>	100.0	100.0	9.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	65.0	89.4
<b>LF (%)</b>	99.8	97.8	5.6	98.5	100.2	100.4	100.2	99.2	99.5	99.1	100.3	62.5	88.4
<b>OF (%)</b>	100.0	100.0	9.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	64.9	89.4
<b>EUF (%)</b>	0.0	0.0	90.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0	10.6
<b>PUF (%)</b>	0.0	0.0	90.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0	10.6
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 15 Feb 1967  
**Date of First Criticality:** 26 Apr 1972  
**Date of Grid Connection:** 23 May 1972  
**Date of Commercial Operation:** 10 Mar 1973

**Lifetime Generation:** 176402.8 GW(e).h  
**Cumulative Energy Availability Factor:** 75.3%  
**Cumulative Load Factor:** 70.2%  
**Cumulative Unit Capability Factor:** 76.0%  
**Cumulative Energy Unavailability Factor:** 24.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	4392.2	800.0	86.4	86.4	86.4	86.4	74.8	74.8	6238	84.9
1974	4643.8	800.0	82.6	84.3	82.6	84.3	66.3	70.1	7232	82.6
1975	2490.9	798.0	35.7	67.2	35.7	67.2	35.6	58.0	4555	52.0
1976	4320.0	769.0	64.0	66.4	64.0	66.4	64.0	59.5	7143	81.3
1977	4369.3	769.0	64.9	66.1	64.9	66.1	64.9	60.6	7118	81.3
1978	4429.1	769.0	65.7	66.0	65.7	66.0	65.7	61.5	7022	80.2
1979	3993.6	769.0	59.3	65.1	59.3	65.1	59.3	61.1	7686	87.7
1980	3651.6	769.0	62.8	64.8	62.5	64.7	54.1	60.3	5486	62.5
1981	3770.7	769.0	68.1	65.2	68.1	65.1	56.0	59.8	5957	68.0
1982	5062.3	769.0	84.0	67.0	84.0	67.0	75.1	61.3	7343	83.8
1983	3158.5	769.0	64.2	66.8	64.2	66.8	46.9	60.0	5620	64.2
1984	4984.4	769.0	77.9	67.7	77.9	67.7	73.8	61.2	6837	77.8
1985	4560.7	769.0	71.3	68.0	71.3	68.0	67.7	61.7	6247	71.3
1986	4728.0	769.0	74.2	68.4	74.2	68.4	70.2	62.3	6399	73.0
1987	4953.0	769.0	78.1	69.1	78.1	69.1	73.5	63.0	6832	78.0
1988	4178.9	769.0	70.5	69.2	70.5	69.2	61.9	63.0	6193	70.5
1989	5743.1	769.0	95.5	70.7	95.5	70.7	85.3	64.3	8363	95.5
1990	4373.6	769.0	70.4	70.7	70.4	70.7	64.9	64.3	6186	70.6
1991	5285.2	769.0	88.3	71.6	88.3	71.6	78.5	65.1	7731	88.3
1992	3464.2	769.0	64.0	71.2	64.0	71.2	51.3	64.4	5621	64.0
1993	3111.8	769.0	51.8	70.3	51.8	70.3	46.2	63.5	4538	51.8
1994	4013.3	769.0	65.7	70.1	65.7	70.1	59.6	63.3	5745	65.6
1995	2497.0	769.0	45.3	69.0	45.3	69.0	37.1	62.2	3966	45.3
1996	4666.8	769.0	98.8	70.3	72.3	69.2	69.1	62.5	6348	72.3
1997	2627.7	769.0	42.3	69.2	42.3	68.1	39.0	61.5	3718	42.4
1998	3819.6	769.0	59.0	68.8	58.2	67.7	56.7	61.3	5095	58.2
1999	6596.7	769.0	97.5	69.8	97.5	68.8	97.9	62.7	8537	97.5
2000	6220.6	769.0	92.9	70.7	92.9	69.7	92.1	63.7	8156	92.9
2001	6273.8	769.0	91.9	71.4	91.9	70.4	93.1	64.8	8058	92.0
2002	6556.8	855.0	90.4	72.1	90.4	71.2	89.8	65.7	7852	89.6
2003	6975.1	855.0	94.0	72.9	94.0	72.0	93.1	66.6	8181	93.4
2004	6179.4	855.0	90.5	73.5	90.5	72.6	82.3	67.2	7955	90.6
2005	7036.9	864.0	97.4	74.3	97.4	73.4	93.0	68.0	8533	97.4
2006	6611.0	867.0	91.3	74.8	91.3	74.0	87.0	68.7	8000	91.3
2007	7505.8	867.0	99.6	75.6	99.6	74.8	98.8	69.6	8720	99.5
2008	6734.6	867.0	89.4	76.0	89.4	75.3	88.4	70.2	7852	89.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					499	
B. Refuelling without a maintenance outage					14	
C. Inspection, maintenance or repair combined with refuelling	670			971	60	
D. Inspection, maintenance or repair without refuelling	260			139		
E. Testing of plant systems or component:				3	0	
H. Nuclear regulatory requirement					10	0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				95	66	64
Subtotal	930	0	0	1208	649	64
Total	930			1921		

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		12
13. Reactor Auxiliary System:		4
14. Safety Systems		17
15. Reactor Cooling System:		69
16. Steam generation system:		11
17. Safety I&C Systems (excluding reactor I&C)		7
21. Fuel Handling and Storage Facilities		19
31. Turbine and auxiliaries:		86
32. Feedwater and Main Steam System		46
33. Circulating Water System		8
35. All other I&C Systems:		1
41. Main Generator System:		35
42. Electrical Power Supply System:		72
XX. Miscellaneous Systems:		45
Total	0	440

## US-244 R.E. GINNA

**Operator:** CCNPP (Calvert Cliffs Nuclear Power Plant Inc.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 498.0 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 2008

**Net Energy Production:** 4744.0 GW(e).h  
**Energy Availability Factor:** 94.3%  
**Load Factor:** 108.4%  
**Operating Factor:** 94.3%  
**Energy Unavailability Factor:** 5.7%  
**Total Off-line Time:** 504 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	431.3	403.4	430.6	274.3	261.0	413.8	419.8	419.0	410.9	429.0	418.5	432.4	4744.0
<b>EAF (%)</b>	100.0	100.0	100.0	66.1	65.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.3
<b>UCF (%)</b>	100.0	100.0	100.0	66.1	65.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.3
<b>LF (%)</b>	116.4	116.4	116.4	76.5	70.5	115.4	113.3	113.1	114.6	115.8	116.6	116.7	108.4
<b>OF (%)</b>	100.0	100.0	100.0	66.0	65.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.3
<b>EUF (%)</b>	0.0	0.0	0.0	33.9	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7
<b>PUF (%)</b>	0.0	0.0	0.0	33.9	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7
<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	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	25 Apr 1966	<b>Lifetime Generation:</b>	133732.8 GW(e).h
<b>Date of First Criticality:</b>	08 Nov 1969	<b>Cumulative Energy Availability Factor:</b>	84.4%
<b>Date of Grid Connection:</b>	02 Dec 1969	<b>Cumulative Load Factor:</b>	82.6%
<b>Date of Commercial Operation:</b>	01 Jul 1970	<b>Cumulative Unit Capability Factor:</b>	84.4%
		<b>Cumulative Energy Unavailability Factor:</b>	15.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1970	1597.0	448.0	100.0	100.0	100.0	100.0	80.7	80.7	3868	87.6
1971	2871.8	493.0	100.0	100.0	100.0	100.0	66.5	71.0	6592	75.3
1972	2572.1	504.0	100.0	100.0	100.0	100.0	58.1	65.7	6029	68.6
1973	3398.8	490.0	95.0	98.6	95.0	98.6	79.2	69.5	8325	95.0
1974	2097.2	490.0	48.9	87.5	48.9	87.5	48.9	64.9	5465	62.4
1975	3041.1	470.0	73.4	85.0	73.4	85.0	73.9	66.5	6709	76.6
1976	2060.8	470.0	49.7	79.8	49.7	79.8	49.9	64.0	5113	58.2
1977	3028.5	470.0	73.6	79.0	73.6	79.0	73.6	65.3	7489	85.5
1978	3218.7	470.0	77.5	78.8	77.5	78.8	78.2	66.7	7058	80.6
1979	2960.5	470.0	71.3	78.0	71.3	78.0	71.9	67.3	6375	72.8
1980	3093.5	470.0	76.0	77.8	76.0	77.8	74.9	68.0	6673	76.0
1981	3322.5	470.0	82.2	78.2	82.2	78.2	80.7	69.1	7194	82.1
1982	2408.0	470.0	58.9	76.7	58.9	76.7	58.5	68.2	5150	58.8
1983	3040.1	470.0	74.9	76.5	74.9	76.5	73.8	68.7	6529	74.5
1984	3156.8	470.0	77.2	76.6	77.2	76.6	76.5	69.2	6779	77.2
1985	3620.3	470.0	87.9	77.3	87.9	77.3	87.9	70.4	7700	87.9
1986	3610.3	470.0	87.4	77.9	87.4	77.9	87.7	71.4	7659	87.4
1987	3797.7	470.0	91.3	78.7	91.3	78.7	92.2	72.6	7994	91.3
1988	3533.2	470.0	86.5	79.1	86.5	79.1	85.6	73.3	7592	86.4
1989	3073.5	470.0	75.0	78.9	75.0	78.9	74.6	73.4	6569	75.0
1990	3451.4	470.0	83.6	79.1	83.6	79.1	83.8	73.9	7325	83.6
1991	3483.3	470.0	86.0	79.4	86.0	79.4	84.6	74.4	7536	86.0
1992	3483.4	470.0	85.8	79.7	85.8	79.7	84.4	74.8	7536	85.8
1993	3499.4	470.0	85.7	80.0	85.7	80.0	85.0	75.2	7509	85.7
1994	3373.7	470.0	82.4	80.1	82.4	80.1	81.9	75.5	7219	82.4
1995	3638.6	470.0	88.8	80.4	88.8	80.4	88.4	76.0	7776	88.8
1996	2898.1	470.0	70.4	80.0	70.4	80.0	70.2	75.8	6175	70.3
1997	3894.7	480.0	91.7	80.5	91.7	80.5	92.6	76.4	8011	91.4
1998	4308.6	480.0	100.0	81.2	100.0	81.2	102.5	77.3	8760	100.0
1999	3534.1	480.0	85.3	81.3	85.3	81.3	84.0	77.6	7444	85.0
2000	3814.1	480.0	91.0	81.6	91.0	81.6	90.5	78.0	8001	91.1
2001	4286.3	480.0	100.0	82.2	100.0	82.2	101.9	78.8	8760	100.0
2002	3843.3	480.0	90.4	82.5	90.4	82.5	91.4	79.2	7951	90.8
2003	3868.6	480.0	90.1	82.7	90.1	82.7	92.0	79.5	7925	90.5
2004	4308.5	480.0	99.4	83.2	99.4	83.2	102.2	80.2	8733	99.4
2005	3996.7	498.0	93.3	83.5	93.3	83.5	91.6	80.5	8166	93.2
2006	4119.2	493.0	92.2	83.7	92.2	83.7	95.3	81.0	8157	93.1
2007	4930.5	498.0	99.0	84.2	99.0	84.2	113.0	81.9	8675	99.0
2008	4744.0	498.0	94.3	84.4	94.3	84.4	108.4	82.6	8280	94.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1971 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					204	
B. Refuelling without a maintenance					2	
C. Inspection, maintenance or repair combined with refuelling	502			1092		
D. Inspection, maintenance or repair without refuelling				74	1	
E. Testing of plant systems or component				1	0	
H. Nuclear regulatory requirement					0	18
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					11	
L. Human factor related					0	
Subtotal	502	0	0	1167	218	18
Total	502			1403		

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

System	2008 Hours Lost	1971 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		15
13. Reactor Auxiliary Systems		2
14. Safety Systems		16
15. Reactor Cooling Systems		9
16. Steam generation system		40
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System		35
33. Circulating Water System		5
35. All other I&C Systems		1
42. Electrical Power Supply System		17
Total	0	180

# US-458 RIVER BEND-1

Operator: ENTGS (ENTERGY GULF STATES INC.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 970.0 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 2008

Net Energy Production: 6366.6 GW(e).h

Energy Availability Factor: 77.1%

Load Factor: 74.7%

Operating Factor: 77.1%

Energy Unavailability Factor: 22.9%

Total Off-line Time: 2013 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	117.2	0.0	347.8	712.1	720.7	671.4	727.7	718.2	166.6	735.7	716.1	733.1	6366.6
EAF (%)	18.8	0.0	73.8	100.0	100.0	100.0	100.0	100.0	28.1	100.0	100.0	100.0	77.1
UCF (%)	18.8	0.0	73.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.0
LF (%)	16.2	0.0	48.3	102.0	99.9	96.1	100.8	99.5	23.8	101.9	102.4	101.6	74.7
OF (%)	18.8	0.0	73.8	100.0	100.0	100.0	100.0	100.0	28.1	100.0	100.0	100.0	77.1
EUF (%)	81.2	100.0	26.2	0.0	0.0	0.0	0.0	0.0	71.9	0.0	0.0	0.0	22.9
PUF (%)	81.2	100.0	8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.5
UCLF (%)	0.0	0.0	17.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71.9	0.0	0.0	0.0	5.9

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 25 Mar 1977      Lifetime Generation: 147924.6 GW(e).h

Date of First Criticality: 31 Oct 1985      Cumulative Energy Availability Factor: 81.4%

Date of Grid Connection: 03 Dec 1985      Cumulative Load Factor: 78.6%

Date of Commercial Operation: 16 Jun 1986      Cumulative Unit Capability Factor: 81.7%

   Cumulative Energy Unavailability Factor: 18.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1986	2310.4	936.0	54.1	54.1	54.1	54.1	48.0	48.0	2763	53.8
1987	4964.4	936.0	66.7	62.0	66.7	62.0	60.5	55.9	5836	66.6
1988	7249.0	936.0	92.8	73.9	92.8	73.9	88.2	68.4	8149	92.8
1989	4785.0	936.0	66.9	72.0	66.9	72.0	58.4	65.6	5853	66.8
1990	5592.6	936.0	75.8	72.8	75.8	72.8	68.2	66.2	6642	75.8
1991	6687.2	936.0	85.7	75.1	85.7	75.1	81.6	68.9	7507	85.7
1992	2762.7	936.0	36.5	69.3	36.5	69.3	33.6	63.6	3210	36.5
1993	5257.9	936.0	69.4	69.3	69.4	69.3	64.1	63.6	6076	69.4
1994	4886.2	936.0	62.3	68.5	62.3	68.5	59.6	63.2	5455	62.3
1995	7930.8	936.0	99.4	71.7	99.4	71.7	96.7	66.7	8704	99.4
1996	6860.3	936.0	84.2	72.9	84.2	72.9	83.4	68.2	7391	84.1
1997	6822.7	936.0	84.8	73.9	84.8	73.9	83.2	69.5	7427	84.8
1998	7833.5	936.0	95.9	75.7	95.9	75.7	95.5	71.6	8404	95.9
1999	5704.8	936.0	74.0	75.5	74.0	75.5	69.6	71.5	6476	73.9
2000	7352.7	936.0	88.8	76.4	88.8	76.4	89.4	72.7	7795	88.7
2001	7811.8	936.0	92.4	77.5	92.4	77.5	95.3	74.1	8120	92.7
2002	8472.4	966.0	97.9	78.7	97.9	78.7	100.1	75.7	8579	97.9
2003	7653.2	966.0	91.8	79.5	91.8	79.5	90.4	76.6	8050	91.9
2004	7427.4	966.0	88.2	80.0	88.2	80.0	87.5	77.2	7758	88.3
2005	7822.5	978.0	93.2	80.7	93.2	80.7	91.3	78.0	8162	93.2
2006	7478.3	966.0	90.4	81.2	90.4	81.2	88.4	78.5	7921	90.4
2007	7184.6	970.0	90.5	81.6	90.5	81.6	84.6	78.8	7916	90.4
2008	6366.6	970.0	83.0	81.7	77.1	81.4	74.7	78.6	6771	77.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		129		5	380	
B. Refuelling without a maintenance					25	
C. Inspection, maintenance or repair combined with refuelling	1363			790		
D. Inspection, maintenance or repair without refuelling				193	8	
E. Testing of plant systems or component:	2			13	4	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				11	148	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			517			
Subtotal	1365	129	517	1012	565	0
Total	2011			1577		

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		75
13. Reactor Auxiliary System:		3
15. Reactor Cooling System:		93
17. Safety I&C Systems (excluding reactor I&C)		11
31. Turbine and auxiliaries:	60	49
32. Feedwater and Main Steam System	68	45
33. Circulating Water System		3
35. All other I&C Systems:		11
41. Main Generator System:		26
42. Electrical Power Supply System:		34
XX. Miscellaneous Systems:		5
Total	128	355



## US-272 SALEM-1

**Operator:** PSEGPOWER (PSEG Power, Inc.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1174.0 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 2008

**Net Energy Production:** 9333.8 GW(e).h  
**Energy Availability Factor:** 91.7%  
**Load Factor:** 90.5%  
**Operating Factor:** 91.7%  
**Energy Unavailability Factor:** 8.3%  
**Total Off-line Time:** 731 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	853.1	825.4	838.9	844.1	874.4	838.9	852.4	857.2	826.9	383.0	460.2	879.0	9333.8
<b>EAF (%)</b>	98.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	44.6	57.9	100.0	91.7
<b>UCF (%)</b>	98.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	44.6	57.9	100.0	91.7
<b>LF (%)</b>	97.7	101.0	96.2	99.9	100.1	99.2	97.6	98.1	97.8	43.8	54.4	100.6	90.5
<b>OF (%)</b>	98.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	44.6	57.8	100.0	91.7
<b>EUf (%)</b>	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.4	42.1	0.0	8.3
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.4	42.1	0.0	8.1
<b>UCLF (%)</b>	1.9	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 25 Sep 1968  
**Date of First Criticality:** 11 Dec 1976  
**Date of Grid Connection:** 25 Dec 1976  
**Date of Commercial Operation:** 30 Jun 1977

**Lifetime Generation:** 196319.5 GW(e).h  
**Cumulative Energy Availability Factor:** 66.9%  
**Cumulative Load Factor:** 63.8%  
**Cumulative Unit Capability Factor:** 67.1%  
**Cumulative Energy Unavailability Factor:** 33.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1977	2058.8	1079.0	50.8	50.8	50.8	50.8	37.2	37.2	2432	47.4
1978	4537.0	1079.0	48.0	49.0	48.0	49.0	48.0	44.0	4862	55.5
1979	2084.3	1079.0	22.0	38.6	22.0	38.6	22.1	35.5	2231	25.5
1980	5689.8	1079.0	74.2	48.6	69.5	47.2	60.0	42.4	6075	69.2
1981	6191.3	1079.0	78.5	55.1	78.5	54.0	65.5	47.4	6839	78.1
1982	4107.4	1079.0	47.0	53.6	47.0	52.8	43.5	46.7	4192	47.9
1983	5408.8	1079.0	57.6	54.2	57.6	53.5	57.2	48.3	5127	58.5
1984	2160.1	1079.0	27.1	50.6	27.1	50.0	22.8	44.9	2378	27.1
1985	9007.5	1079.0	95.2	55.8	95.2	55.3	95.3	50.8	8345	95.3
1986	7084.0	1083.0	78.6	58.2	78.6	57.7	74.6	53.3	6921	79.0
1987	6216.6	1106.0	73.1	59.6	72.6	59.2	64.2	54.3	6362	72.6
1988	7418.6	1106.0	77.9	61.3	77.9	60.8	76.4	56.3	6841	77.9
1989	6213.3	1106.0	69.2	61.9	69.2	61.5	64.1	56.9	6059	69.2
1990	5999.2	1106.0	67.0	62.3	67.0	61.9	61.9	57.3	5868	67.0
1991	6810.3	1106.0	74.0	63.1	74.0	62.7	70.3	58.2	6479	74.0
1992	5307.8	1106.0	58.0	62.8	58.0	62.4	54.6	58.0	5090	57.9
1993	5870.6	1106.0	65.6	62.9	65.6	62.6	60.6	58.1	5746	65.6
1994	5779.3	1106.0	67.0	63.2	67.0	62.9	59.7	58.2	5865	67.0
1995	2554.4	1106.0	30.1	61.4	30.1	61.1	26.4	56.5	2632	30.0
1996	0.0	1106.0	0.0	58.2	0.0	57.9	0.0	53.6	0	0.0
1997	0.0	1106.0	0.0	55.3	0.0	55.1	0.0	50.9	0	0.0
1998	6475.6	1106.0	70.8	56.1	70.8	55.8	66.8	51.7	6199	70.8
1999	8009.2	1106.0	87.5	57.5	87.5	57.2	82.7	53.1	7663	87.5
2000	8952.6	1106.0	94.8	59.1	94.8	58.8	92.2	54.7	8328	94.8
2001	7709.4	1096.0	80.9	59.9	80.9	59.7	80.8	55.8	7116	81.2
2002	8620.6	1096.0	89.5	61.1	89.5	60.9	89.8	57.1	7855	89.7
2003	9096.7	1096.0	95.8	62.4	95.8	62.2	94.7	58.5	8401	95.9
2004	7452.7	1159.0	77.6	63.0	77.6	62.8	75.2	59.2	6766	77.0
2005	9440.6	1111.0	92.5	64.0	92.5	63.8	97.0	60.5	8105	92.5
2006	10228.1	1174.0	99.6	65.3	99.6	65.1	99.5	61.9	8725	99.6
2007	9158.5	1174.0	91.5	66.2	91.5	66.1	89.1	62.8	8013	91.5
2008	9333.8	1174.0	91.7	67.1	91.7	66.9	90.5	63.8	8053	91.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1977 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		14			1343	
B. Refuelling without a maintenance outage					9	
C. Inspection, maintenance or repair combined with refuelling	715			1020		
D. Inspection, maintenance or repair without refuelling				101	37	
E. Testing of plant systems or component				1	1	
H. Nuclear regulatory requirement					119	34
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				13	100	0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					5	
Z. Others					9	
Subtotal	715	14	0	1135	1623	35
Total	729			2793		

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

System	2008 Hours Lost	1977 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		1
12. Reactor I&C Systems		83
13. Reactor Auxiliary Systems		6
14. Safety Systems		18
15. Reactor Cooling Systems		89
16. Steam generation system		477
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries		249
32. Feedwater and Main Steam System		114
33. Circulating Water System		58
35. All other I&C Systems		6
41. Main Generator Systems		109
42. Electrical Power Supply Systems	14	32
XX. Miscellaneous Systems		3
Total	14	1249

## US-311 SALEM-2

**Operator:** PSEGPOWER (PSEG Power, Inc.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1130.0 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 2008

**Net Energy Production:** 8222.0 GW(e).h  
**Energy Availability Factor:** 82.8%  
**Load Factor:** 81.6%  
**Operating Factor:** 82.9%  
**Energy Unavailability Factor:** 17.2%  
**Total Off-line Time:** 1499 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	859.1	796.8	259.8	0.0	430.3	823.3	848.5	860.3	805.7	840.5	817.9	879.7	8222.0
<b>EAF (%)</b>	100.0	100.0	33.4	-2.3	60.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.8
<b>UCF (%)</b>	100.0	100.0	33.4	-2.3	60.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.8
<b>LF (%)</b>	102.2	101.3	30.9	0.0	50.0	98.9	98.7	100.0	96.8	97.7	98.1	102.3	81.6
<b>OF (%)</b>	100.0	100.0	34.9	0.0	60.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.9
<b>EUF (%)</b>	0.0	0.0	66.6	102.3	39.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2
<b>PUF (%)</b>	0.0	0.0	66.6	102.3	24.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	14.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 25 Sep 1968  
**Date of First Criticality:** 08 Aug 1980  
**Date of Grid Connection:** 03 Jun 1981  
**Date of Commercial Operation:** 13 Oct 1981

**Lifetime Generation:** 173792.0 GW(e).h  
**Cumulative Energy Availability Factor:** 69.3%  
**Cumulative Load Factor:** 65.2%  
**Cumulative Unit Capability Factor:** 69.3%  
**Cumulative Energy Unavailability Factor:** 30.7%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	1632.1	1105.0	96.3	96.3	96.3	96.3	76.9	76.9	1817	94.6
1982	7941.7	1106.0	97.5	97.3	97.5	97.3	82.0	81.1	8517	97.2
1983	775.2	1106.0	12.6	59.2	12.6	59.2	8.0	48.1	1078	12.3
1984	3225.7	1106.0	36.4	52.1	36.4	52.1	33.2	43.5	3192	36.3
1985	5033.8	1106.0	56.2	53.1	56.2	53.1	52.0	45.5	4923	56.2
1986	5317.7	1106.0	61.6	54.7	61.6	54.7	54.9	47.3	5388	61.5
1987	6176.6	1106.0	72.4	57.5	72.4	57.5	63.8	49.9	6338	72.4
1988	5982.2	1106.0	66.5	58.8	66.5	58.8	61.6	51.6	5838	66.5
1989	7824.6	1106.0	84.7	61.9	84.7	61.9	80.8	55.1	7419	84.7
1990	5446.1	1106.0	72.2	63.0	72.2	63.0	56.2	55.2	5163	58.9
1991	7662.3	1106.0	82.1	64.9	82.1	64.9	79.1	57.6	7188	82.1
1992	4744.6	1106.0	53.1	63.8	53.1	63.8	48.8	56.8	4657	53.0
1993	5575.5	1106.0	60.9	63.6	60.9	63.6	57.5	56.8	5328	60.8
1994	5606.8	1106.0	69.4	64.0	69.4	64.0	57.9	56.9	6076	69.4
1995	2071.7	1106.0	25.8	61.4	25.8	61.4	21.4	54.4	2261	25.8
1996	0.0	1106.0	0.0	57.3	0.0	57.3	0.0	50.8	0	0.0
1997	2564.3	1106.0	32.4	55.8	32.4	55.8	26.5	49.3	2834	32.4
1998	7797.2	1106.0	83.2	57.4	83.2	57.4	80.5	51.1	7287	83.2
1999	7949.4	1106.0	84.8	58.9	84.8	58.9	82.0	52.8	7431	84.8
2000	8381.7	1106.0	89.0	60.4	89.0	60.4	86.3	54.6	7819	89.0
2001	9517.6	1092.0	99.7	62.4	99.7	62.4	100.0	56.8	8736	99.7
2002	8367.4	1092.0	86.8	63.5	86.8	63.5	87.5	58.2	7620	87.0
2003	8095.6	1116.0	83.7	64.4	83.7	64.4	84.5	59.4	7355	84.0
2004	8799.8	1116.0	90.3	65.5	90.3	65.5	89.8	60.7	7945	90.4
2005	8886.0	1129.0	90.1	66.6	90.1	66.6	89.8	61.9	7897	90.1
2006	9147.4	1130.0	93.9	67.7	93.9	67.7	92.4	63.2	8220	93.8
2007	9669.4	1130.0	97.1	68.8	97.1	68.8	97.7	64.5	8506	97.1
2008	8222.0	1156.0	82.8	69.3	82.8	69.3	81.6	65.2	7285	82.9

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		28			1138	
B. Refuelling without a maintenance					8	
C. Inspection, maintenance or repair combined with refuelling	1388			932		
D. Inspection, maintenance or repair without refuelling				112	25	
E. Testing of plant systems or component:				0	0	
H. Nuclear regulatory requirement		81			16	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				4	302	
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)					5	
Z. Others					12	
Subtotal	1388	109	0	1048	1506	0
Total		1497			2554	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		44
13. Reactor Auxiliary Systems		5
14. Safety Systems		53
15. Reactor Cooling System		79
16. Steam generation system		215
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries		109
32. Feedwater and Main Steam System		111
33. Circulating Water System	28	6
35. All other I&C Systems		10
41. Main Generator System		284
42. Electrical Power Supply System		202
XX. Miscellaneous Systems		9
Total	28	1129

# US-361 SAN ONOFRE-2

Operator: SCE (SOUTHERN CALIFORNIA EDISON)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1070.0 MW(e)  
 Design Net Capacity: 1070.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 8856.8 GW(e).h  
 Energy Availability Factor: 92.1%  
 Load Factor: 94.2%  
 Operating Factor: 92.1%  
 Energy Unavailability Factor: 7.9%  
 Total Off-line Time: 695 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	279.5	774.5	836.1	771.7	832.2	568.0	825.2	830.8	777.2	834.6	806.3	720.8	8856.8
EAF (%)	41.1	100.0	100.0	100.0	100.0	77.8	100.0	100.0	100.0	100.0	100.0	87.2	92.1
UCF (%)	41.1	100.0	100.0	100.0	100.0	77.8	100.0	100.0	100.0	100.0	100.0	87.2	92.1
LF (%)	35.1	104.0	105.2	100.2	104.5	73.7	103.7	104.4	100.9	104.8	104.5	90.5	94.2
OF (%)	41.0	100.0	100.0	100.0	100.0	77.8	100.0	100.0	100.0	100.0	100.0	87.1	92.1
EUF (%)	58.9	0.0	0.0	0.0	0.0	22.2	0.0	0.0	0.0	0.0	0.0	12.8	7.9
PUF (%)	58.9	0.0	0.0	0.0	0.0	8.5	0.0	0.0	0.0	0.0	0.0	12.8	6.8
UCLF (%)	0.0	0.0	0.0	0.0	0.0	13.7	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Mar 1974      Lifetime Generation: 196475.9 GW(e).h  
 Date of First Criticality: 26 Jul 1982      Cumulative Energy Availability Factor: 81.4%  
 Date of Grid Connection: 20 Sep 1982      Cumulative Load Factor: 82.0%  
 Date of Commercial Operation: 08 Aug 1983      Cumulative Unit Capability Factor: 81.4%  
    Cumulative Energy Unavailability Factor: 18.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	2775.6	1083.0	73.5	73.5	73.5	73.5	69.8	69.8	2560	69.7
1984	5272.6	1070.0	58.9	63.2	58.9	63.2	56.1	60.2	5167	58.8
1985	5174.0	1070.0	58.4	61.2	58.4	61.2	55.2	58.1	5114	58.4
1986	6371.3	1070.0	71.6	64.3	71.6	64.3	68.0	61.0	6266	71.5
1987	6247.3	1070.0	69.3	65.4	69.3	65.4	66.7	62.3	6067	69.3
1988	9002.7	1070.0	93.8	70.6	93.8	70.6	95.8	68.5	8237	93.8
1989	5237.7	1070.0	56.6	68.5	56.6	68.5	55.9	66.5	4956	56.6
1990	8309.7	1070.0	87.4	71.0	87.4	71.0	88.7	69.5	7657	87.4
1991	5769.4	1070.0	64.4	70.2	64.4	70.2	61.6	68.5	5637	64.3
1992	8795.2	1070.0	93.5	72.7	93.5	72.7	93.6	71.2	8214	93.5
1993	7655.0	1070.0	82.4	73.6	82.4	73.6	81.7	72.2	7213	82.3
1994	9309.2	1070.0	100.0	75.9	100.0	75.9	99.3	74.6	8760	100.0
1995	6496.0	1070.0	70.8	75.5	70.8	75.5	69.3	74.2	6197	70.7
1996	8550.2	1070.0	91.3	76.7	91.3	76.7	91.0	75.4	8016	91.3
1997	6656.3	1070.0	70.8	76.3	70.8	76.3	71.0	75.1	6197	70.7
1998	8430.2	1070.0	88.9	77.1	88.9	77.1	89.9	76.1	7792	88.9
1999	8243.5	1070.0	85.0	77.6	85.0	77.6	87.9	76.8	7447	85.0
2000	8524.2	1070.0	89.0	78.2	89.0	78.2	90.7	77.6	7818	89.0
2001	9492.0	1070.0	97.5	79.3	97.5	79.3	101.3	78.9	8538	97.5
2002	8510.5	1070.0	87.0	79.7	87.0	79.7	90.8	79.5	7618	87.0
2003	9712.5	1070.0	99.0	80.6	99.0	80.6	103.6	80.7	8671	99.0
2004	8068.0	1070.0	82.7	80.7	82.7	80.7	85.8	80.9	7263	82.7
2005	8931.7	1070.0	92.7	81.3	92.7	81.3	95.3	81.6	8117	92.6
2006	6769.3	1070.0	70.0	80.8	70.0	80.8	72.2	81.2	6134	70.0
2007	8304.1	1070.0	85.9	81.0	85.9	81.0	88.6	81.5	7526	85.9
2008	8856.8	1070.0	92.1	81.4	92.1	81.4	94.2	82.0	8089	92.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				2	339	
B. Refuelling without a maintenance					37	
C. Inspection, maintenance or repair combined with refuelling	438			1103		
D. Inspection, maintenance or repair without refuelling	156			120		
E. Testing of plant systems or component:		98		4		
H. Nuclear regulatory requirement					30	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				27	24	
L. Human factor related					1	
Subtotal	594	98	0	1256	431	0
Total		692			1687	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		2
12. Reactor I&C Systems		18
13. Reactor Auxiliary System:		2
14. Safety Systems		2
15. Reactor Cooling System:		77
16. Steam generation system:		69
31. Turbine and auxiliaries:		15
32. Feedwater and Main Steam System		69
33. Circulating Water System		19
41. Main Generator System:		35
42. Electrical Power Supply System:		17
XX. Miscellaneous Systems:		8
Total	0	333



# US-362 SAN ONOFRE-3

Operator: SCE (SOUTHERN CALIFORNIA EDISON)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1080.0 MW(e)  
 Design Net Capacity: 1070.0 MW(e)  
 Design Discharge Burnup: 33000 MW.d/t  
 Status at end of year: Operational

## 2. Production Summary 2008

Net Energy Production: 6541.3 GW(e).h  
 Energy Availability Factor: 71.7%  
 Load Factor: 69.0%  
 Operating Factor: 71.6%  
 Energy Unavailability Factor: 28.3%  
 Total Off-line Time: 2492 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	841.1	745.2	842.5	403.0	380.7	805.9	837.1	802.8	399.0	219.0	0.0	264.9	6541.3
EAF (%)	100.0	100.0	100.0	51.7	59.2	100.0	100.0	100.0	65.0	38.7	0.0	45.0	71.7
UCF (%)	100.0	100.0	100.0	51.7	59.2	100.0	100.0	100.0	65.0	38.7	0.0	45.0	71.7
LF (%)	104.7	99.1	105.0	51.8	47.4	103.6	104.2	99.9	51.3	27.3	0.0	33.0	69.0
OF (%)	100.0	100.0	100.0	51.7	59.1	100.0	100.0	100.0	64.9	38.6	0.0	45.0	71.6
EUF (%)	0.0	0.0	0.0	48.3	40.8	0.0	0.0	0.0	35.0	61.3	100.0	55.0	28.3
PUF (%)	0.0	0.0	0.0	48.3	40.8	0.0	0.0	0.0	0.0	61.3	100.0	55.0	25.5
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	2.9
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Mar 1974      Lifetime Generation: 189916.7 GW(e).h  
 Date of First Criticality: 29 Aug 1983      Cumulative Energy Availability Factor: 81.5%  
 Date of Grid Connection: 25 Sep 1983      Cumulative Load Factor: 80.4%  
 Date of Commercial Operation: 01 Apr 1984      Cumulative Unit Capability Factor: 81.5%  
    Cumulative Energy Unavailability Factor: 18.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	4112.2	1080.0	62.9	62.9	62.9	62.9	57.7	57.7	4103	62.2
1985	3735.9	1080.0	53.8	57.7	53.8	57.7	39.5	47.3	4708	53.7
1986	6760.6	1080.0	80.7	66.1	80.7	66.1	71.5	56.1	7067	80.7
1987	7523.6	1080.0	79.8	69.7	79.8	69.7	79.5	62.3	6987	79.8
1988	6146.0	1080.0	65.1	68.7	65.1	68.7	64.8	62.8	5714	65.1
1989	8840.6	1080.0	93.9	73.1	93.9	73.1	93.4	68.2	8224	93.9
1990	6602.0	1080.0	70.3	72.7	70.3	72.7	69.8	68.4	6159	70.3
1991	8693.2	1080.0	92.4	75.2	92.4	75.2	91.9	71.4	8094	92.4
1992	6830.8	1080.0	74.4	75.1	74.4	75.1	72.0	71.5	6533	74.4
1993	7128.2	1080.0	76.4	75.3	76.4	75.3	75.3	71.9	6689	76.4
1994	9147.7	1080.0	99.8	77.5	99.8	77.5	96.7	74.2	8742	99.8
1995	7501.6	1080.0	81.9	77.9	81.9	77.9	79.3	74.6	7175	81.9
1996	8838.6	1080.0	94.6	79.2	94.6	79.2	93.2	76.1	8313	94.6
1997	6842.9	1080.0	72.6	78.7	72.6	78.7	72.3	75.8	6357	72.6
1998	9058.6	1080.0	94.8	79.8	94.8	79.8	95.7	77.2	8304	94.8
1999	8416.5	1080.0	87.4	80.3	87.4	80.3	89.0	77.9	7658	87.4
2000	9633.8	1080.0	100.0	81.5	100.0	81.5	101.5	79.3	8784	100.0
2001	5679.3	1080.0	58.9	80.2	58.9	80.2	60.0	78.2	5170	59.0
2002	9548.2	1080.0	98.8	81.2	98.8	81.2	100.9	79.4	8658	98.8
2003	8596.3	1080.0	88.4	81.6	88.4	81.6	90.9	80.0	7741	88.4
2004	6985.6	1080.0	72.8	81.2	72.2	81.1	73.6	79.7	6344	72.2
2005	9468.3	1080.0	98.4	81.9	98.4	81.9	100.1	80.7	8616	98.3
2006	6827.6	1080.0	72.0	81.5	72.0	81.5	72.2	80.3	6308	72.0
2007	8905.6	1080.0	90.9	81.9	90.9	81.9	94.1	80.9	7963	90.9
2008	6541.3	1080.0	71.7	81.5	71.7	81.5	69.0	80.4	6292	71.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					451	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	1586			904		
D. Inspection, maintenance or repair without refuelling				76		
E. Testing of plant systems or component:				5		
H. Nuclear regulatory requirement		252				
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					5	
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 of coast-down operation)	650			28		
Subtotal	2236	252	0	1013	457	2
Total		2488			1472	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		35
13. Reactor Auxiliary System:		6
14. Safety Systems		87
15. Reactor Cooling System:		65
16. Steam generation system:		54
31. Turbine and auxiliaries		10
32. Feedwater and Main Steam System		11
41. Main Generator System:		36
42. Electrical Power Supply System:		36
Total	0	340

# US-443 SEABROOK-1

Operator: FPL (FLORIDA POWER &amp; LIGHT CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1245.0 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 2008

Net Energy Production: 9349.6 GW(e).h  
 Energy Availability Factor: 86.5%  
 Load Factor: 85.5%  
 Operating Factor: 86.5%  
 Energy Unavailability Factor: 13.5%  
 Total Off-line Time: 1188 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	567.5	840.0	922.1	0.0	667.5	855.9	927.1	925.6	896.4	926.5	895.1	926.1	9349.6
EAF (%)	61.7	100.0	100.0	0.0	75.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	86.5
UCF (%)	61.7	100.0	100.0	0.0	75.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	86.5
LF (%)	61.3	96.9	99.7	0.0	72.1	95.5	100.1	99.9	100.0	100.0	99.7	100.0	85.5
OF (%)	61.6	100.0	100.0	0.0	75.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	86.5
EUF (%)	38.3	0.0	0.0	100.0	24.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5
PUF (%)	0.0	0.0	0.0	100.0	24.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.3
UCLF (%)	38.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 07 Jul 1976      Lifetime Generation: 161597.4 GW(e).h  
 Date of First Criticality: 13 Jun 1989      Cumulative Energy Availability Factor: 86.5%  
 Date of Grid Connection: 29 May 1990      Cumulative Load Factor: 85.3%  
 Date of Commercial Operation: 19 Aug 1990      Cumulative Unit Capability Factor: 86.6%  
    Cumulative Energy Unavailability Factor: 13.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1990	3443.5	1151.0	85.2	85.2	85.2	85.2	81.5	81.5	3131	85.2
1991	6814.4	1150.0	73.0	76.6	73.0	76.6	67.6	71.7	6394	73.0
1992	7868.4	1150.0	80.3	78.1	80.3	78.1	77.9	74.3	7056	80.3
1993	9046.8	1150.0	92.4	82.3	92.4	82.3	89.8	78.8	8094	92.4
1994	6203.5	1150.0	62.3	77.8	62.3	77.8	61.6	74.9	5466	62.4
1995	8380.6	1150.0	85.2	79.1	85.2	79.1	83.1	76.4	7465	85.2
1996	9844.2	1158.0	99.0	82.2	99.0	82.2	96.8	79.6	8690	98.9
1997	7945.7	1158.0	79.2	81.8	79.2	81.8	78.3	79.5	6929	79.1
1998	8388.4	1158.0	83.3	82.0	83.3	82.0	82.7	79.8	7294	83.3
1999	8685.7	1156.0	86.3	82.5	86.3	82.5	85.8	80.5	7564	86.3
2000	7921.5	1155.0	78.7	82.1	78.7	82.1	78.1	80.2	6910	78.7
2001	8692.2	1155.0	90.6	82.8	87.9	82.6	85.9	80.7	7703	87.9
2002	9293.4	1155.0	92.2	83.6	92.2	83.4	91.9	81.6	8083	92.3
2003	9275.4	1155.0	92.7	84.3	92.7	84.1	91.7	82.4	8121	92.7
2004	10177.0	1155.0	100.0	85.4	100.0	85.2	100.3	83.6	8784	100.0
2005	9455.2	1159.0	90.5	85.7	90.5	85.5	93.1	84.2	7928	90.5
2006	9397.4	1224.0	87.9	85.9	87.9	85.7	87.6	84.5	7718	88.1
2007	10763.9	1245.0	99.0	86.7	99.0	86.5	98.7	85.3	8669	99.0
2008	9349.6	1245.0	86.5	86.6	86.5	86.5	85.5	85.3	7596	86.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1990 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		285			291	
C. Inspection, maintenance or repair combined with refuelling	901			784		
D. Inspection, maintenance or repair without refuelling				13	1	
E. Testing of plant systems or component:				1	5	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	3	12
Subtotal	901	285	0	798	300	12
Total	1186			1110		

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

System	2008 Hours Lost	1990 to 2008 Average Hours Lost Per Year
13. Reactor Auxiliary System:		91
15. Reactor Cooling System:		44
17. Safety I&C Systems (excluding reactor I&C)		4
31. Turbine and auxiliaries:		34
32. Feedwater and Main Steam System:		18
35. All other I&C Systems:		20
41. Main Generator System:		48
42. Electrical Power Supply System:	285	26
Total	285	285

# US-327 SEQUOYAH-1

**Operator:** TVA (TENNESSEE VALLEY AUTHORITY)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 1148.0 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 2008

**Net Energy Production:** 10164.8 GW(e).h  
**Energy Availability Factor:** 99.5%  
**Load Factor:** 100.8%  
**Operating Factor:** 99.5%  
**Energy Unavailability Factor:** 0.5%  
**Total Off-line Time:** 46 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	813.3	818.5	873.5	845.0	862.2	832.8	848.8	848.3	845.7	853.9	845.3	877.4	10164.8
<b>EAF (%)</b>	93.9	100.0	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>	93.9	100.0	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>	95.2	102.4	102.4	102.2	100.9	100.8	99.4	99.3	102.3	100.0	102.1	102.7	100.8
<b>OF (%)</b>	93.8	100.0	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>	6.1	0.0	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	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>	6.1	0.0	0.0	0.0	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. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	27 May 1970	<b>Lifetime Generation:</b>	192110.3 GW(e).h
<b>Date of First Criticality:</b>	05 Jul 1980	<b>Cumulative Energy Availability Factor:</b>	71.2%
<b>Date of Grid Connection:</b>	22 Jul 1980	<b>Cumulative Load Factor:</b>	69.3%
<b>Date of Commercial Operation:</b>	01 Jul 1981	<b>Cumulative Unit Capability Factor:</b>	71.2%
		<b>Cumulative Energy Unavailability Factor:</b>	28.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1981	2526.9	1128.0	62.1	62.1	62.1	62.1	50.7	50.7	2688	60.9
1982	4909.7	1128.0	53.4	56.3	53.4	56.3	49.7	50.0	4626	52.8
1983	7340.9	1139.0	78.2	65.1	78.2	65.1	73.6	59.5	6791	77.5
1984	6104.7	1148.0	69.1	66.3	69.1	66.3	60.5	59.8	5992	68.2
1985	4076.1	1148.0	44.7	61.4	44.7	61.4	40.5	55.5	3760	42.9
1986	0.0	1148.0	0.0	50.2	0.0	50.2	0.0	45.3	0	0.0
1987	0.0	1148.0	0.0	42.4	0.0	42.4	0.0	38.3	0	0.0
1988	127.7	1148.0	6.3	37.6	6.3	37.6	1.3	33.4	282	3.2
1989	9550.6	1148.0	98.5	44.8	98.5	44.8	95.0	40.6	8624	98.4
1990	6840.7	1148.0	74.0	47.9	74.0	47.9	68.0	43.5	6406	73.1
1991	7270.1	1122.0	77.6	50.7	77.6	50.7	74.0	46.4	6774	77.3
1992	8402.5	1122.0	88.2	53.9	88.2	53.9	85.3	49.7	7734	88.0
1993	1290.5	1122.0	14.8	50.8	14.8	50.8	13.1	46.8	1219	13.9
1994	6111.6	1111.0	66.0	51.9	66.0	51.9	62.8	48.0	5774	65.9
1995	6829.5	1111.0	75.6	53.5	75.6	53.5	70.2	49.5	6620	75.6
1996	9293.5	1112.0	95.1	56.1	95.1	56.1	95.1	52.4	8344	95.0
1997	8324.3	1117.0	85.5	57.9	85.5	57.9	85.1	54.3	7486	85.5
1998	8905.7	1118.0	91.0	59.8	91.0	59.8	90.9	56.4	7966	90.9
1999	9987.0	1122.0	100.0	61.9	100.0	61.9	101.6	58.8	8760	100.0
2000	7720.5	1122.0	79.5	62.8	79.5	62.8	78.3	59.8	6988	79.6
2001	9019.0	1122.0	91.2	64.2	91.2	64.2	91.8	61.4	7988	91.2
2002	9953.5	1125.0	100.0	65.8	100.0	65.8	101.1	63.2	8760	100.0
2003	7351.1	1125.0	73.6	66.2	73.6	66.2	74.6	63.7	6443	73.6
2004	9290.5	1148.0	91.4	67.3	91.4	67.3	92.1	64.9	8027	91.4
2005	10076.5	1150.0	98.8	68.6	98.8	68.6	100.0	66.4	8658	98.8
2006	9086.0	1150.0	90.4	69.4	90.4	69.4	90.2	67.3	7915	90.4
2007	8758.3	1148.0	87.5	70.1	87.5	70.1	87.1	68.1	7668	87.5
2008	10164.8	1148.0	99.5	71.2	99.5	71.2	100.8	69.3	8738	99.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1981 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		45			602	
B. Refuelling without a maintenance					17	
C. Inspection, maintenance or repair combined with refuelling				831		
D. Inspection, maintenance or repair without refuelling				12	25	
E. Testing of plant systems or component				1		
F. Major back-fitting, refurbishment or upgrading activities with refuelling					4	
H. Nuclear regulatory requirement				39	325	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				49	582	
L. Human factor related					3	
Subtotal	0	45	0	932	1558	0
Total		45			2490	

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

System	2008 Hours Lost	1981 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		21
13. Reactor Auxiliary System		16
14. Safety Systems		14
15. Reactor Cooling System		58
16. Steam generation system	45	3
31. Turbine and auxiliaries		34
32. Feedwater and Main Steam System		308
35. All other I&C Systems		6
41. Main Generator System		93
42. Electrical Power Supply System		33
Total	45	586

# US-328 SEQUOYAH-2

Operator: TVA (TENNESSEE VALLEY AUTHORITY)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1126.0 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 2008

Net Energy Production: 8752.6 GW(e).h  
 Energy Availability Factor: 88.2%  
 Load Factor: 88.5%  
 Operating Factor: 88.2%  
 Energy Unavailability Factor: 11.8%  
 Total Off-line Time: 1035 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	865.9	808.1	861.7	773.4	85.2	671.5	832.8	809.0	793.8	861.2	525.8	864.4	8752.6
EAF (%)	100.0	100.0	100.0	100.0	12.9	85.6	100.0	97.7	95.2	100.0	68.0	100.0	88.2
UCF (%)	100.0	100.0	100.0	100.0	12.9	85.6	100.0	97.7	95.2	100.0	68.0	100.0	88.2
LF (%)	103.4	103.1	103.0	95.4	10.2	82.8	99.4	96.6	97.9	102.8	64.8	103.2	88.5
OF (%)	100.0	100.0	100.0	100.0	12.9	85.6	100.0	97.7	95.1	100.0	68.0	100.0	88.2
EUF (%)	0.0	0.0	0.0	0.0	87.1	14.4	0.0	2.3	4.8	0.0	32.0	0.0	11.8
PUF (%)	0.0	0.0	0.0	0.0	87.1	14.4	0.0	2.3	4.8	0.0	0.0	0.0	9.1
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.0	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 27 May 1970  
 Date of First Criticality: 05 Nov 1981  
 Date of Grid Connection: 23 Dec 1981  
 Date of Commercial Operation: 01 Jun 1982

Lifetime Generation: 191475.6 GW(e).h  
 Cumulative Energy Availability Factor: 75.2%  
 Cumulative Load Factor: 72.3%  
 Cumulative Unit Capability Factor: 75.2%  
 Cumulative Energy Unavailability Factor: 24.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1982	3926.3	1145.0	75.0	75.0	75.0	75.0	66.8	66.8	3804	74.1
1983	6691.4	1133.0	72.8	73.6	72.8	73.6	67.4	67.2	6346	72.4
1984	6403.3	1148.0	69.8	72.1	69.8	72.1	63.5	65.7	6112	69.6
1985	5625.0	1148.0	59.8	68.7	59.8	68.7	55.9	63.0	5223	59.6
1986	0.0	1148.0	0.0	53.7	0.0	53.7	0.0	49.2	0	0.0
1987	0.0	1148.0	0.0	44.0	0.0	44.0	0.0	40.4	0	0.0
1988	3934.7	1148.0	59.4	46.4	59.4	46.4	39.0	40.2	5097	58.0
1989	6067.7	1148.0	70.7	49.6	70.7	49.6	60.3	42.8	6103	69.7
1990	7185.5	1148.0	79.1	53.0	79.1	53.0	71.5	46.2	6864	78.4
1991	9318.9	1122.0	96.9	57.5	96.9	57.5	94.8	51.2	8482	96.8
1992	7276.1	1122.0	80.3	59.6	80.3	59.6	73.8	53.3	7031	80.0
1993	2094.4	1122.0	26.3	56.8	26.3	56.8	21.3	50.6	2213	25.3
1994	5849.4	1106.0	61.8	57.2	61.8	57.2	60.4	51.3	5415	61.8
1995	8887.7	1106.0	92.1	59.7	92.1	59.7	91.7	54.2	8064	92.1
1996	7682.5	1108.0	78.6	61.0	78.6	61.0	78.9	55.9	6894	78.5
1997	8725.6	1117.0	91.5	62.9	91.5	62.9	89.2	58.0	8001	91.3
1998	9799.6	1117.0	98.8	65.0	98.8	65.0	100.1	60.5	8656	98.8
1999	8979.0	1117.0	93.7	66.7	93.7	66.7	91.8	62.2	8203	93.6
2000	9058.3	1117.0	92.9	68.1	92.9	68.1	92.3	63.8	8158	92.9
2001	9939.9	1117.0	100.0	69.7	100.0	69.7	101.6	65.7	8760	100.0
2002	8542.0	1126.0	87.3	70.5	87.3	70.5	87.1	66.8	7640	87.2
2003	8258.3	1126.0	84.6	71.2	84.6	71.2	83.7	67.6	7401	84.5
2004	9464.9	1124.0	95.1	72.2	95.1	72.2	95.9	68.8	8353	95.1
2005	8922.6	1127.0	89.8	73.0	89.8	73.0	90.4	69.7	7867	89.8
2006	8914.7	1127.0	90.6	73.7	90.6	73.7	90.3	70.6	7931	90.5
2007	9892.4	1126.0	99.2	74.7	99.2	74.7	100.3	71.7	8692	99.2
2008	8752.6	1126.0	88.2	75.2	88.2	75.2	88.5	72.3	7749	88.2



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1982 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		230			481	
B. Refuelling without a maintenance					21	
C. Inspection, maintenance or repair combined with refuelling	751			707		
D. Inspection, maintenance or repair without refuelling	51			36		
E. Testing of plant systems or component:				1		
H. Nuclear regulatory requirement					441	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					415	
Subtotal	802	230	0	744	1358	0
Total		1032			2102	

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

System	2008 Hours Lost	1982 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems:		4
13. Reactor Auxiliary System:		8
14. Safety Systems:		1
15. Reactor Cooling System:		49
16. Steam generation system:		26
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries:		27
32. Feedwater and Main Steam System:	230	55
35. All other I&C Systems:		2
41. Main Generator System:		274
42. Electrical Power Supply System:		19
Total	230	466

# US-400 SHEARON HARRIS-1

Operator: PROGENGC (Progress Energy Carolinas, Inc.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 900.0 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 2008

Net Energy Production: 7821.4 GW(e).h  
 Energy Availability Factor: 97.2%  
 Load Factor: 98.9%  
 Operating Factor: 97.2%  
 Energy Unavailability Factor: 2.8%  
 Total Off-line Time: 250 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	692.2	644.2	684.1	661.2	679.6	648.3	672.5	436.4	656.3	686.1	668.9	691.6	7821.4
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	66.5	100.0	100.0	100.0	100.0	97.2
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	66.5	100.0	100.0	100.0	100.0	97.2
LF (%)	103.4	102.8	102.3	102.0	101.5	100.0	100.4	65.2	101.3	102.5	103.1	103.3	98.9
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	66.4	100.0	100.0	100.0	100.0	97.2
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.5	0.0	0.0	0.0	0.0	2.8
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	33.5	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 28 Jan 1978      Lifetime Generation: 139714.7 GW(e).h  
 Date of First Criticality: 03 Jan 1987      Cumulative Energy Availability Factor: 87.9%  
 Date of Grid Connection: 19 Jan 1987      Cumulative Load Factor: 86.9%  
 Date of Commercial Operation: 02 May 1987      Cumulative Unit Capability Factor: 87.9%  
    Cumulative Energy Unavailability Factor: 12.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	Data not provided									
1988	5345.6	860.0	73.6	73.6	73.6	73.6	70.8	70.8	6458	73.5
1989	5638.8	860.0	78.5	76.0	78.5	76.0	74.8	72.8	6873	78.5
1990	6339.0	860.0	89.2	80.4	89.2	80.4	84.1	76.6	7812	89.2
1991	5927.4	860.0	80.8	80.5	80.8	80.5	78.7	77.1	7080	80.8
1992	5427.9	860.0	74.0	79.2	74.0	79.2	71.9	76.1	6501	74.0
1993	7527.7	860.0	99.6	82.6	99.6	82.6	99.9	80.0	8721	99.6
1994	6065.1	860.0	82.2	82.5	82.2	82.5	80.5	80.1	7195	82.1
1995	5966.3	860.0	83.1	82.6	83.1	82.6	79.2	80.0	7279	83.1
1996	7067.7	860.0	95.3	84.0	94.6	83.9	93.6	81.5	8301	94.5
1997	5909.0	860.0	79.2	83.5	79.2	83.5	78.4	81.2	6934	79.2
1998	6711.6	860.0	90.1	84.1	90.1	84.1	89.1	81.9	7891	90.1
1999	7244.1	860.0	96.9	85.2	96.9	85.1	96.2	83.1	8484	96.8
2000	6878.0	860.0	92.2	85.7	92.2	85.7	91.0	83.7	8098	92.2
2001	5401.5	860.0	72.3	84.8	72.3	84.7	71.7	82.8	6335	72.3
2002	7835.0	900.0	99.0	85.8	98.7	85.7	99.4	84.0	8643	98.7
2003	7236.9	900.0	92.3	86.2	92.3	86.1	91.8	84.5	8082	92.3
2004	7008.4	900.0	87.5	86.3	87.5	86.2	88.7	84.8	7687	87.5
2005	7930.8	900.0	99.4	87.0	99.4	87.0	100.6	85.7	8710	99.4
2006	7029.3	900.0	88.5	87.1	88.5	87.1	89.2	85.9	7749	88.5
2007	7403.1	900.0	93.4	87.4	93.4	87.4	93.9	86.3	8176	93.3
2008	7821.4	900.0	97.2	87.9	97.2	87.9	98.9	86.9	8534	97.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		249			161	
B. Refuelling without a maintenance					1	
C. Inspection, maintenance or repair combined with refuelling	814					
D. Inspection, maintenance or repair without refuelling	68				6	
E. Testing of plant systems or component	1					
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					2	4
Subtotal	0	249	0	883	170	4
Total		249			1057	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		28
15. Reactor Cooling System:		0
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries	249	59
32. Feedwater and Main Steam System		46
41. Main Generator System:		15
42. Electrical Power Supply System:		2
XX. Miscellaneous Systems		5
Total	249	157

# US-498 SOUTH TEXAS-1

Operator: STP (STP Nuclear Operating Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 10800.6 GW(e).h  
 Energy Availability Factor: 92.3%  
 Load Factor: 96.1%  
 Operating Factor: 92.3%  
 Energy Unavailability Factor: 7.7%  
 Total Off-line Time: 676 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1015.4	948.7	851.7	97.7	1000.6	958.0	987.7	987.3	962.2	996.5	979.2	1015.4	10800.6
EAF (%)	100.0	100.0	93.3	13.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.3
UCF (%)	100.0	100.0	93.3	13.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.3
LF (%)	106.6	106.5	89.6	10.6	105.1	104.0	103.7	103.7	104.4	104.6	106.1	106.6	96.1
OF (%)	100.0	100.0	93.3	13.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.3
EUF (%)	0.0	0.0	6.7	86.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7
PUF (%)	0.0	0.0	6.7	86.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 22 Dec 1975      Lifetime Generation: 178913.7 GW(e).h  
 Date of First Criticality: 08 Mar 1988      Cumulative Energy Availability Factor: 80.6%  
 Date of Grid Connection: 30 Mar 1988      Cumulative Load Factor: 79.8%  
 Date of Commercial Operation: 25 Aug 1988      Cumulative Unit Capability Factor: 80.6%  
    Cumulative Energy Unavailability Factor: 19.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1988	2791.5	1250.0	77.7	77.7	77.7	77.7	72.1	72.1	2404	77.6
1989	6307.7	1250.0	63.1	66.9	63.1	66.9	57.6	61.4	5524	63.1
1990	6072.9	1251.0	59.4	63.7	59.4	63.7	55.4	58.9	5198	59.3
1991	7239.8	1251.0	69.3	65.4	69.3	65.4	66.1	61.0	6069	69.3
1992	7265.1	1251.0	68.7	66.1	68.7	66.1	66.1	62.2	6033	68.7
1993	666.0	1251.0	7.7	55.2	7.7	55.2	6.1	51.7	676	7.7
1994	8251.4	1251.0	78.2	58.8	78.2	58.8	75.3	55.4	6842	78.1
1995	9301.8	1251.0	86.5	62.6	86.5	62.6	84.9	59.4	7570	86.4
1996	10226.8	1251.0	93.5	66.3	93.5	66.3	93.1	63.5	8213	93.5
1997	9873.2	1251.0	91.6	69.0	91.6	69.0	90.1	66.3	8019	91.5
1998	10859.9	1250.0	99.8	72.0	99.8	72.0	99.1	69.5	8739	99.8
1999	9645.4	1250.0	89.7	73.5	89.7	73.5	88.1	71.1	7857	89.7
2000	8591.9	1250.0	78.6	74.0	78.6	74.0	78.3	71.7	6905	78.6
2001	10338.2	1250.0	94.1	75.5	94.1	75.5	94.4	73.4	8240	94.1
2002	10867.9	1250.0	97.9	77.0	97.9	77.0	99.0	75.2	8573	97.9
2003	6858.8	1250.0	62.3	76.1	62.3	76.1	62.6	74.4	5433	62.0
2004	11103.6	1250.0	99.2	77.5	99.2	77.5	101.1	76.0	8712	99.2
2005	9901.9	1280.0	89.6	78.2	89.6	78.2	88.3	76.7	7845	89.5
2006	10144.5	1280.0	90.7	78.9	90.7	78.9	90.5	77.5	7942	90.7
2007	11804.8	1280.0	100.0	80.0	100.0	80.0	105.3	79.0	8760	100.0
2008	10800.6	1280.0	92.3	80.6	92.3	80.6	96.1	79.8	8108	92.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					758	
B. Refuelling without a maintenance					17	
C. Inspection, maintenance or repair combined with refuelling	675			695		
D. Inspection, maintenance or repair without refuelling				75	49	
E. Testing of plant systems or component:				6		
H. Nuclear regulatory requirement					18	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0		
Subtotal	675	0	0	776	842	0
Total	675			1618		

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary Systems		6
14. Safety Systems		443
15. Reactor Cooling Systems		12
17. Safety I&C Systems (excluding reactor I&C)		153
31. Turbine and auxiliaries		19
32. Feedwater and Main Steam System		22
35. All other I&C Systems		8
41. Main Generator Systems		78
42. Electrical Power Supply Systems		6
Total	0	749

## US-499 SOUTH TEXAS-2

Operator: STP (STP Nuclear Operating Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 10739.1 GW(e).h  
 Energy Availability Factor: 91.6%  
 Load Factor: 95.5%  
 Operating Factor: 91.6%  
 Energy Unavailability Factor: 8.4%  
 Total Off-line Time: 737 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	1015.0	947.7	1009.0	970.6	998.6	954.8	984.2	983.7	923.0	105.7	831.8	1015.0	10739.1
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.6	88.0	100.0	91.6
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.6	88.0	100.0	91.6
LF (%)	106.6	106.4	106.1	105.3	104.9	103.6	103.3	103.3	100.2	11.1	90.1	106.6	95.5
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	12.6	87.9	100.0	91.6
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.4	12.0	0.0	8.4
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.4	12.0	0.0	8.4
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 (%)	0.0	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. 2008 Summary of Operation

### 5. Historical Summary

Date of Construction Start: 22 Dec 1975      Lifetime Generation: 173721.0 GW(e).h  
 Date of First Criticality: 12 Mar 1989      Cumulative Energy Availability Factor: 81.9%  
 Date of Grid Connection: 11 Apr 1989      Cumulative Load Factor: 80.7%  
 Date of Commercial Operation: 19 Jun 1989      Cumulative Unit Capability Factor: 81.9%  
    Cumulative Energy Unavailability Factor: 18.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	3026.7	1250.0	60.5	60.5	60.5	60.5	51.5	51.5	2845	60.5
1990	6452.2	1251.0	62.8	62.0	62.8	62.0	58.9	56.3	5494	62.7
1991	7268.0	1251.0	70.0	65.2	70.0	65.2	66.3	60.2	6134	70.0
1992	10341.0	1251.0	97.3	74.3	97.3	74.3	94.1	69.8	8548	97.3
1993	690.3	1251.0	8.0	59.7	8.0	59.7	6.3	55.8	702	8.0
1994	5991.0	1251.0	58.2	59.4	58.2	59.4	54.7	55.6	5098	58.2
1995	9923.1	1251.0	91.2	64.3	91.2	64.3	90.5	61.0	7985	91.2
1996	10457.9	1251.0	95.3	68.4	95.3	68.4	95.2	65.5	8373	95.3
1997	9972.9	1251.0	92.4	71.2	92.4	71.2	91.0	68.5	8093	92.4
1998	9983.9	1250.0	92.5	73.4	92.5	73.4	91.1	70.9	8096	92.4
1999	9799.3	1250.0	91.7	75.2	91.7	75.2	89.5	72.6	8034	91.7
2000	10557.2	1250.0	96.2	77.0	96.2	77.0	96.1	74.7	8449	96.2
2001	9537.6	1250.0	88.5	77.9	88.5	77.9	87.1	75.7	7751	88.5
2002	8219.8	1250.0	75.9	77.8	75.9	77.8	75.1	75.6	6663	76.1
2003	8920.2	1250.0	81.1	78.0	81.1	78.0	81.5	76.0	7112	81.2
2004	10304.1	1250.0	92.3	78.9	92.3	78.9	93.8	77.2	8121	92.5
2005	9937.2	1280.0	89.8	79.6	89.8	79.6	88.6	77.9	7866	89.8
2006	11226.0	1280.0	100.0	80.8	100.0	80.8	100.1	79.2	8760	100.0
2007	10373.7	1280.0	90.7	81.3	90.7	81.3	92.5	79.9	7943	90.7
2008	10739.1	1280.0	91.6	81.9	91.6	81.9	95.5	80.7	8047	91.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					533	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling	736			881		
D. Inspection, maintenance or repair without refuelling				80		
E. Testing of plant systems or component:				2		
H. Nuclear regulatory requirement					2	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					6	
Z. Others					1	
Subtotal	736	0	0	963	551	0
Total		736			1514	

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		2
13. Reactor Auxiliary System:		11
14. Safety Systems		202
15. Reactor Cooling System:		9
16. Steam generation system:		16
17. Safety I&C Systems (excluding reactor I&C)		7
31. Turbine and auxiliaries		105
32. Feedwater and Main Steam System		49
33. Circulating Water System		1
35. All other I&C Systems		9
41. Main Generator System:		44
42. Electrical Power Supply System:		45
Total	0	500

# US-335 ST. LUCIE-1

**Operator:** FPL (FLORIDA POWER & LIGHT CO.)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 839.0 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 2008

**Net Energy Production:** 6673.0 GW(e).h  
**Energy Availability Factor:** 89.6%  
**Load Factor:** 90.5%  
**Operating Factor:** 89.6%  
**Energy Unavailability Factor:** 10.4%  
**Total Off-line Time:** 912 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	639.0	597.8	624.5	617.4	637.0	615.6	637.2	504.4	608.1	372.4	178.9	640.8	6673.0
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.6	100.0	60.1	32.8	100.0	89.6
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.6	100.0	60.1	32.8	100.0	89.6
<b>LF (%)</b>	102.4	102.4	100.2	102.2	102.0	101.9	102.1	80.8	100.7	59.7	29.6	102.7	90.5
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.5	100.0	60.1	32.7	100.0	89.6
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.4	0.0	39.9	67.2	0.0	10.4
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.9	67.2	0.0	8.9
<b>UCLF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.4	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. 2008 Summary of Operation



## 5. Historical Summary

**Date of Construction Start:** 01 Jul 1970  
**Date of First Criticality:** 22 Apr 1976  
**Date of Grid Connection:** 07 May 1976  
**Date of Commercial Operation:** 21 Dec 1976

**Lifetime Generation:** 190209.9 GW(e).h  
**Cumulative Energy Availability Factor:** 81.9%  
**Cumulative Load Factor:** 81.7%  
**Cumulative Unit Capability Factor:** 82.1%  
**Cumulative Energy Unavailability Factor:** 18.1%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1976	99.0	814.0	100.0	100.0	100.0	100.0	16.6	16.6	264	35.5
1977	5343.7	779.0	78.4	80.1	78.4	80.1	78.3	73.3	7414	84.6
1978	5009.7	777.0	73.7	77.0	73.7	77.0	73.6	73.5	6674	76.2
1979	4889.6	777.0	71.7	75.3	71.7	75.3	71.8	72.9	6469	73.8
1980	5201.9	777.0	76.0	75.5	76.0	75.5	76.2	73.7	6797	77.4
1981	4954.7	777.0	70.5	74.5	70.5	74.5	72.8	73.6	6364	72.6
1982	6784.6	803.0	94.1	77.8	94.1	77.8	96.5	77.4	8227	93.9
1983	1099.5	820.0	15.4	68.6	15.4	68.6	15.3	68.3	1350	15.4
1984	4243.3	822.0	60.8	67.6	58.6	67.3	58.8	67.1	5154	58.7
1985	5868.6	825.0	80.4	69.1	80.4	68.8	81.1	68.7	7067	80.7
1986	7052.0	829.0	95.7	71.8	95.7	71.6	97.1	71.6	8351	95.3
1987	5719.2	839.0	77.8	72.4	77.8	72.2	77.8	72.2	6812	77.8
1988	6256.0	839.0	84.4	73.4	84.4	73.2	84.9	73.3	7407	84.3
1989	6947.3	839.0	94.3	75.1	94.3	74.9	94.5	75.0	8257	94.3
1990	4503.5	839.0	64.3	74.3	64.3	74.1	61.3	74.0	5463	62.4
1991	5793.3	839.0	80.9	74.7	80.9	74.6	78.8	74.3	7089	80.9
1992	7142.2	839.0	96.5	76.1	96.5	76.0	96.9	75.7	8479	96.5
1993	5440.5	839.0	76.6	76.2	76.2	76.0	74.0	75.6	6678	76.2
1994	6183.6	839.0	86.8	76.8	86.8	76.6	84.1	76.1	7600	86.8
1995	5519.4	839.0	76.2	76.7	76.2	76.6	75.1	76.1	6662	76.1
1996	5222.0	839.0	73.8	76.6	73.8	76.5	70.9	75.8	6472	73.7
1997	5717.7	839.0	78.1	76.7	78.1	76.5	77.8	75.9	6842	78.1
1998	7035.5	839.0	95.8	77.5	95.8	77.4	95.7	76.8	8393	95.8
1999	6532.7	839.0	89.9	78.1	88.5	77.9	88.9	77.3	7752	88.5
2000	7513.7	839.0	100.0	79.0	100.0	78.9	102.0	78.4	8784	100.0
2001	6709.8	839.0	90.4	79.5	90.4	79.3	91.3	78.9	7915	90.4
2002	6919.4	839.0	93.2	80.0	93.2	79.9	94.1	79.5	8163	93.2
2003	7504.8	839.0	100.0	80.8	100.0	80.6	102.1	80.4	8760	100.0
2004	6324.3	839.0	90.4	81.1	85.6	80.8	85.8	80.6	7518	85.6
2005	6088.1	839.0	82.4	81.2	82.4	80.9	82.8	80.6	7217	82.4
2006	7463.3	839.0	100.0	81.8	100.0	81.5	101.5	81.3	8760	100.0
2007	6235.8	839.0	84.7	81.9	84.7	81.6	84.8	81.5	7417	84.7
2008	6673.0	839.0	89.6	82.1	89.6	81.9	90.5	81.7	7872	89.6

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1976 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		129		0	358	
B. Refuelling without a maintenance outage					22	
C. Inspection, maintenance or repair combined with refuelling	781			1087		
D. Inspection, maintenance or repair without refuelling				80	6	
E. Testing of plant systems or component				3		
H. Nuclear regulatory requirement				6		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	8	13
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						12
Subtotal	781	129	0	1176	394	25
Total		910			1595	

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

System	2008 Hours Lost	1976 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		28
12. Reactor I&C Systems		8
13. Reactor Auxiliary System		14
14. Safety Systems		5
15. Reactor Cooling System		106
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		9
32. Feedwater and Main Steam System		13
33. Circulating Water System		3
41. Main Generator System		13
42. Electrical Power Supply System		22
XX. Miscellaneous Systems	129	10
Total	129	232

# US-389 ST. LUCIE-2

**Operator:** FPL (FLORIDA POWER & LIGHT CO.)  
**Contractor:** CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 839.0 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 2008

**Net Energy Production:** 7087.3 GW(e).h  
**Energy Availability Factor:** 95.2%  
**Load Factor:** 96.2%  
**Operating Factor:** 95.2%  
**Energy Unavailability Factor:** 4.8%  
**Total Off-line Time:** 423 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	472.3	429.1	629.9	612.6	635.2	524.9	637.5	635.0	612.1	635.7	621.8	641.1	7087.3
<b>EAF (%)</b>	79.0	73.3	100.0	100.0	100.0	88.8	100.0	100.0	100.0	100.0	100.0	100.0	95.2
<b>UCF (%)</b>	79.1	73.3	100.0	100.0	100.0	88.8	100.0	100.0	100.0	100.0	100.0	100.0	95.2
<b>LF (%)</b>	75.7	73.5	101.0	101.4	101.8	86.9	102.1	101.7	101.3	101.8	102.8	102.7	96.2
<b>OF (%)</b>	79.0	73.3	100.0	100.0	100.0	88.8	100.0	100.0	100.0	100.0	100.0	100.0	95.2
<b>EUf (%)</b>	21.0	26.7	0.0	0.0	0.0	11.2	0.0	0.0	0.0	0.0	0.0	0.0	4.8
<b>PUf (%)</b>	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
<b>UCLF (%)</b>	8.9	26.7	0.0	0.0	0.0	11.2	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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 02 May 1977 **Lifetime Generation:** 158660.6 GW(e).h  
**Date of First Criticality:** 02 Jun 1983 **Cumulative Energy Availability Factor:** 86.1%  
**Date of Grid Connection:** 13 Jun 1983 **Cumulative Load Factor:** 85.2%  
**Date of Commercial Operation:** 08 Aug 1983 **Cumulative Unit Capability Factor:** 86.5%  
**Cumulative Energy Unavailability Factor:** 13.9%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	2397.5	808.0	89.4	89.4	89.4	89.4	87.0	87.0	3129	89.3
1984	5564.8	786.0	82.9	84.7	79.5	82.3	80.6	82.4	7067	80.5
1985	6108.6	824.0	83.9	84.4	83.9	83.0	84.6	83.4	7368	84.1
1986	6151.2	837.0	82.8	83.9	82.8	82.9	83.9	83.5	7253	82.8
1987	5950.2	839.0	82.3	83.5	82.3	82.8	81.0	82.9	7206	82.3
1988	7407.1	839.0	100.0	86.6	100.0	86.0	100.5	86.2	8784	100.0
1989	5443.4	839.0	74.6	84.7	74.6	84.2	74.1	84.3	6531	74.6
1990	5341.5	839.0	74.1	83.3	74.1	82.8	72.7	82.7	6487	74.1
1991	7428.7	839.0	100.0	85.3	100.0	84.9	101.1	84.9	8760	100.0
1992	5431.2	839.0	75.1	84.2	75.1	83.9	73.7	83.7	6598	75.1
1993	4719.9	839.0	76.4	83.4	76.4	83.1	64.2	81.8	6687	76.3
1994	5607.4	839.0	79.6	83.1	79.6	82.8	76.3	81.3	6971	79.6
1995	5295.9	839.0	75.0	82.4	75.0	82.2	72.1	80.6	6570	75.0
1996	6984.8	839.0	96.2	83.5	96.2	83.2	94.8	81.7	8444	96.1
1997	6498.9	839.0	88.6	83.8	88.6	83.6	88.4	82.1	7756	88.5
1998	6739.5	839.0	91.4	84.3	91.4	84.1	91.7	82.7	8009	91.4
1999	7213.0	839.0	98.0	85.2	98.0	85.0	98.1	83.7	8583	98.0
2000	6804.3	839.0	91.6	85.5	91.6	85.4	92.3	84.2	8041	91.5
2001	6707.5	839.0	91.1	85.8	91.1	85.7	91.3	84.6	7979	91.1
2002	7425.0	839.0	99.8	86.6	99.8	86.4	101.0	85.4	8742	99.8
2003	5891.3	839.0	81.3	86.3	81.3	86.1	80.2	85.2	7120	81.3
2004	6781.4	839.0	98.2	86.9	91.8	86.4	92.0	85.5	8059	91.7
2005	6283.1	839.0	87.9	86.9	86.8	86.4	85.5	85.5	7602	86.8
2006	6048.2	839.0	84.9	86.8	84.9	86.4	82.3	85.4	7434	84.9
2007	5170.5	839.0	71.2	86.2	71.2	85.7	70.3	84.7	6232	71.1
2008	7087.3	839.0	95.2	86.5	95.2	86.1	96.2	85.2	8361	95.2

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		291			280	
B. Refuelling without a maintenance					3	
C. Inspection, maintenance or repair combined with refuelling	89			799		
D. Inspection, maintenance or repair without refuelling				29	16	
E. Testing of plant systems or component				2	0	
H. Nuclear regulatory requirement				0		1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	23	9
L. Human factor related		41			1	
N. Environmental conditions (lack of cooling water due to dry weather, flood, storm, lightning, etc.)						25
Subtotal	89	332	0	830	323	35
Total		421			1188	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		29
14. Safety Systems		13
15. Reactor Cooling System	252	125
17. Safety I&C Systems (excluding reactor I&C)		3
31. Turbine and auxiliaries		44
32. Feedwater and Main Steam System	39	44
33. Circulating Water System		0
41. Main Generator System		16
42. Electrical Power Supply System		2
Total	291	276

# US-280 SURRY-1

**Operator:** VEPCO (VIRGINIA ELECTRIC POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 799.0 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 2008

**Net Energy Production:** 6890.5 GW(e).h  
**Energy Availability Factor:** 97.5%  
**Load Factor:** 98.2%  
**Operating Factor:** 97.4%  
**Energy Unavailability Factor:** 2.5%  
**Total Off-line Time:** 224 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	603.2	563.4	603.1	477.7	598.5	577.4	595.3	594.8	577.9	512.8	582.9	603.5	6890.5
<b>EAF (%)</b>	100.0	100.0	100.0	83.3	100.0	100.0	100.0	100.0	100.0	86.2	100.0	100.0	97.5
<b>UCF (%)</b>	100.0	100.0	100.0	83.3	100.0	100.0	100.0	100.0	100.0	86.2	100.0	100.0	97.5
<b>LF (%)</b>	101.5	101.3	101.6	83.0	100.7	100.4	100.1	100.1	100.5	86.3	101.2	101.5	98.2
<b>OF (%)</b>	100.0	100.0	100.0	83.2	100.0	100.0	100.0	100.0	100.0	86.2	100.0	100.0	97.4
<b>EUF (%)</b>	0.0	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	13.8	0.0	0.0	2.5
<b>PUF (%)</b>	0.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	13.8	0.0	0.0	2.2
<b>UCLF (%)</b>	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 25 Jun 1968  
**Date of First Criticality:** 01 Jul 1972  
**Date of Grid Connection:** 04 Jul 1972  
**Date of Commercial Operation:** 22 Dec 1972

**Lifetime Generation:** 181975.6 GW(e).h  
**Cumulative Energy Availability Factor:** 74.7%  
**Cumulative Load Factor:** 72.9%  
**Cumulative Unit Capability Factor:** 74.7%  
**Cumulative Energy Unavailability Factor:** 25.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	280.7	794.0	100.0	100.0	100.0	100.0	47.9	47.9	496	66.7
1973	3479.7	788.0	61.9	64.9	61.9	64.9	50.4	50.2	5377	61.4
1974	3318.1	788.0	54.8	60.0	54.8	60.0	48.1	49.2	4800	54.8
1975	3858.4	788.0	56.1	58.8	56.1	58.8	56.0	51.4	5343	61.2
1976	4396.8	788.0	63.6	59.9	63.6	59.9	63.5	54.4	6010	68.4
1977	5023.9	776.0	74.0	62.7	74.0	62.7	73.9	58.2	6661	76.0
1978	4704.2	775.0	69.3	63.8	69.3	63.8	69.3	60.0	6291	71.8
1979	2255.1	775.0	33.2	59.5	33.2	59.5	33.2	56.2	3045	34.8
1980	2472.6	775.0	42.2	57.4	42.2	57.4	36.3	53.8	3762	42.8
1981	2377.4	775.0	39.0	55.4	39.0	55.4	35.0	51.7	3403	38.8
1982	5483.1	775.0	89.2	58.7	89.2	58.7	80.8	54.6	7776	88.8
1983	3517.1	775.0	56.4	58.5	56.3	58.5	51.8	54.3	5010	57.2
1984	3334.1	775.0	58.1	58.5	58.1	58.4	49.0	53.9	5138	58.5
1985	5618.3	779.0	89.3	60.8	89.3	60.8	82.3	56.1	7827	89.3
1986	4488.6	781.0	68.1	61.3	68.1	61.3	65.6	56.7	6013	68.6
1987	4633.4	781.0	70.1	61.9	70.1	61.9	67.7	57.5	6113	69.8
1988	2685.0	781.0	18.7	59.2	18.7	59.2	39.1	56.3	3632	41.3
1989	3170.5	781.0	46.8	58.5	46.8	58.5	46.3	55.7	4217	48.1
1990	4772.2	781.0	74.9	59.4	74.9	59.4	69.8	56.5	6655	76.0
1991	6590.9	781.0	100.0	61.5	100.0	61.5	96.3	58.6	8760	100.0
1992	5223.8	781.0	79.6	62.4	79.6	62.4	76.1	59.5	7033	80.1
1993	6229.2	781.0	95.9	64.0	95.9	64.0	91.1	61.0	8402	95.9
1994	4881.9	781.0	74.3	64.5	74.3	64.5	71.4	61.5	6560	74.9
1995	5747.0	784.0	85.4	65.4	85.4	65.4	83.6	62.4	7505	85.7
1996	7137.8	801.0	100.0	66.9	100.0	66.9	101.4	64.1	8784	100.0
1997	5640.5	801.0	80.7	67.4	80.7	67.4	80.4	64.8	7067	80.7
1998	5752.4	801.0	81.9	68.0	81.9	68.0	82.0	65.4	7170	81.8
1999	7116.2	801.0	100.0	69.2	100.0	69.2	101.4	66.8	8760	100.0
2000	6548.4	801.0	93.2	70.1	93.2	70.1	93.1	67.7	8188	93.2
2001	5941.6	810.0	84.3	70.6	84.3	70.6	83.7	68.3	7380	84.2
2002	7149.5	810.0	100.0	71.6	100.0	71.6	100.8	69.4	8760	100.0
2003	5419.8	810.0	77.0	71.8	77.0	71.8	76.4	69.7	6741	77.0
2004	6457.1	810.0	90.5	72.4	90.5	72.4	90.8	70.3	7943	90.4
2005	6746.6	810.0	95.6	73.1	95.6	73.1	95.1	71.1	8376	95.6
2006	6311.0	799.0	90.6	73.6	90.6	73.6	90.2	71.7	7931	90.5
2007	6195.2	799.0	88.1	74.0	88.1	74.0	88.5	72.2	7720	88.1
2008	6890.5	799.0	97.5	74.7	97.5	74.7	98.2	72.9	8560	97.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		27			566	
B. Refuelling without a maintenance					19	
C. Inspection, maintenance or repair combined with refuelling				855		
D. Inspection, maintenance or repair without refuelling	195			417	1	
E. Testing of plant systems or component				1	0	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				0		
H. Nuclear regulatory requirement					57	146
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				0	123	0
Subtotal	195	27	0	1273	766	146
Total		222			2185	

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		0
12. Reactor I&C Systems		28
13. Reactor Auxiliary System:		7
14. Safety Systems		5
15. Reactor Cooling System:		200
16. Steam generation system:		58
17. Safety I&C Systems (excluding reactor I&C)		2
31. Turbine and auxiliaries	27	21
32. Feedwater and Main Steam System		93
41. Main Generator System:		7
42. Electrical Power Supply System:		88
XX. Miscellaneous Systems		5
Total	27	514

## US-281 SURRY-2

**Operator:** VEPCO (VIRGINIA ELECTRIC POWER CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 799.0 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 2008

**Net Energy Production:** 6606.8 GW(e).h  
**Energy Availability Factor:** 93.4%  
**Load Factor:** 94.1%  
**Operating Factor:** 93.4%  
**Energy Unavailability Factor:** 6.6%  
**Total Off-line Time:** 579 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	605.8	565.2	604.7	494.8	195.5	579.1	596.9	596.3	576.7	600.6	585.9	605.3	6606.8
<b>EAF (%)</b>	100.0	100.0	100.0	86.7	35.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.4
<b>UCF (%)</b>	100.0	100.0	100.0	86.7	35.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.4
<b>LF (%)</b>	101.9	101.6	101.9	86.0	32.9	100.7	100.4	100.3	100.2	101.0	101.7	101.8	94.1
<b>OF (%)</b>	100.0	100.0	100.0	86.7	35.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.4
<b>EUF (%)</b>	0.0	0.0	0.0	13.3	64.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6
<b>PUF (%)</b>	0.0	0.0	0.0	13.3	64.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6
<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. 2008 Summary of Operation



## 5. Historical Summary

<b>Date of Construction Start:</b>	25 Jun 1968	<b>Lifetime Generation:</b>	181856.4 GW(e).h
<b>Date of First Criticality:</b>	07 Mar 1973	<b>Cumulative Energy Availability Factor:</b>	75.4%
<b>Date of Grid Connection:</b>	10 Mar 1973	<b>Cumulative Load Factor:</b>	73.5%
<b>Date of Commercial Operation:</b>	01 May 1973	<b>Cumulative Unit Capability Factor:</b>	75.5%
		<b>Cumulative Energy Unavailability Factor:</b>	24.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	3064.7	790.0	77.9	77.9	77.9	77.9	66.1	66.1	4533	77.1
1974	2660.5	788.0	44.0	57.6	44.0	57.6	38.5	49.6	3854	44.0
1975	5053.1	788.0	73.3	63.5	73.3	63.5	73.2	58.5	6967	79.5
1976	3343.4	788.0	48.3	59.3	48.3	59.3	48.3	55.7	4585	52.2
1977	4457.3	776.0	65.6	60.7	65.6	60.7	65.6	57.8	5980	68.3
1978	5372.0	775.0	79.1	63.9	79.1	63.9	79.1	61.5	7244	82.7
1979	611.5	775.0	9.0	55.7	9.0	55.7	9.0	53.7	818	9.3
1980	2241.6	775.0	36.0	53.2	36.0	53.2	32.9	51.0	3139	35.7
1981	5150.3	775.0	82.4	56.5	79.6	56.2	75.9	53.9	6972	79.6
1982	5492.2	775.0	88.7	59.8	88.7	59.5	80.9	56.6	7729	88.2
1983	4086.1	775.0	65.0	60.3	65.0	60.0	60.2	57.0	5729	65.4
1984	5209.4	775.0	83.3	62.3	83.3	62.0	76.5	58.6	7327	83.4
1985	4072.4	775.0	65.8	62.5	65.8	62.3	60.0	58.7	5857	66.9
1986	4498.9	780.0	68.7	63.0	68.7	62.8	65.8	59.3	6072	69.3
1987	4791.0	781.0	73.6	63.7	73.6	63.5	70.0	60.0	6456	73.7
1988	3570.9	781.0	56.6	63.3	56.6	63.1	52.1	59.5	4993	56.8
1989	893.6	781.0	13.3	60.3	13.3	60.1	13.1	56.7	1355	15.5
1990	5837.8	781.0	84.8	61.6	84.8	61.5	85.3	58.3	7919	90.4
1991	3985.2	781.0	66.6	61.9	66.6	61.8	58.3	58.3	5886	67.2
1992	6426.5	781.0	96.3	63.7	96.3	63.5	93.7	60.1	8470	96.4
1993	4541.7	781.0	71.0	64.0	71.0	63.9	66.4	60.4	6283	71.7
1994	6261.0	781.0	94.1	65.4	94.1	65.3	91.5	61.9	8251	94.2
1995	5517.4	787.0	80.6	66.1	80.6	66.0	80.0	62.7	7087	80.9
1996	6081.5	801.0	85.9	66.9	85.9	66.8	86.4	63.7	7539	85.8
1997	6451.3	801.0	91.7	68.0	91.7	67.9	91.9	64.9	8034	91.7
1998	7178.9	801.0	100.0	69.3	100.0	69.1	102.3	66.4	8760	100.0
1999	5874.8	801.0	85.6	69.9	85.6	69.8	83.7	67.0	7493	85.5
2000	6539.4	801.0	91.3	70.7	91.3	70.6	92.9	68.0	8022	91.3
2001	6720.7	815.0	93.7	71.5	93.7	71.4	94.1	68.9	8203	93.6
2002	6523.7	815.0	91.0	72.2	91.0	72.1	91.4	69.7	7966	90.9
2003	5612.1	815.0	78.3	72.4	78.3	72.3	78.6	70.0	6861	78.3
2004	7051.7	815.0	98.0	73.2	98.0	73.1	98.5	70.9	8606	98.0
2005	6488.5	815.0	91.9	73.8	91.9	73.7	90.9	71.6	8046	91.8
2006	6189.4	799.0	88.0	74.2	88.0	74.2	88.4	72.1	7705	88.0
2007	7086.3	799.0	100.0	75.0	100.0	74.9	101.2	72.9	8760	100.0
2008	6606.8	799.0	93.4	75.5	93.4	75.4	94.1	73.5	8205	93.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1973 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					549	
B. Refuelling without a maintenance					19	
C. Inspection, maintenance or repair combined with refuelling	578			1238	0	
D. Inspection, maintenance or repair without refuelling				236		
E. Testing of plant systems or component				0		
F. Major back-fitting, refurbishment or upgrading activities with refuelling				1		
H. Nuclear regulatory requirement					18	6
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				5	0	
Subtotal	578	0	0	1480	586	6
Total	578			2072		

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

System	2008 Hours Lost	1973 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		25
13. Reactor Auxiliary System:		4
14. Safety Systems		69
15. Reactor Cooling System:		14
16. Steam generation system:		137
31. Turbine and auxiliaries		118
32. Feedwater and Main Steam System		123
35. All other I&C Systems		1
41. Main Generator System:		5
42. Electrical Power Supply System:		26
XX. Miscellaneous Systems		4
Total	0	526

# US-387 SUSQUEHANNA-1

Operator: PP&amp;L (PENNSYLVANIA POWER &amp; LIGHT CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 1149.0 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 2008

Net Energy Production: 9005.7 GW(e).h

Energy Availability Factor: 87.7%

Load Factor: 89.2%

Operating Factor: 87.7%

Energy Unavailability Factor: 12.3%

Total Off-line Time: 1080 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	864.3	801.5	80.2	314.1	880.2	830.3	870.3	835.4	854.9	898.0	870.5	906.0	9005.7
EAF (%)	100.0	100.0	10.0	46.6	100.0	100.0	100.0	96.5	100.0	100.0	100.0	100.0	87.7
UCF (%)	100.0	100.0	10.0	46.6	100.0	100.0	100.0	96.5	100.0	100.0	100.0	100.0	87.7
LF (%)	101.1	100.2	9.4	38.0	103.0	100.4	101.8	97.7	103.3	105.0	105.1	106.0	89.2
OF (%)	100.0	100.0	10.0	46.5	100.0	100.0	100.0	96.5	100.0	100.0	100.0	100.0	87.7
EUf (%)	0.0	0.0	90.0	53.4	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	12.3
PUf (%)	0.0	0.0	90.0	53.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0
UCLF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 02 Nov 1973      Lifetime Generation: 198602.3 GW(e).h

Date of First Criticality: 10 Sep 1982      Cumulative Energy Availability Factor: 83.6%

Date of Grid Connection: 16 Nov 1982      Cumulative Load Factor: 82.0%

Date of Commercial Operation: 08 Jun 1983      Cumulative Unit Capability Factor: 83.6%

   Cumulative Energy Unavailability Factor: 16.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1983	3536.4	1034.0	76.3	76.3	76.3	76.3	66.6	66.6	3766	73.3
1984	6088.1	1032.0	74.4	75.1	72.0	73.6	67.2	66.9	6377	72.6
1985	5286.4	1032.0	60.4	69.4	60.4	68.5	58.5	63.7	5469	62.4
1986	5839.2	1032.0	66.8	68.7	66.8	68.0	64.6	63.9	5992	68.4
1987	6132.9	1032.0	70.7	69.1	70.7	68.6	67.8	64.8	6331	72.3
1988	8410.1	1032.0	93.1	73.4	93.1	73.0	92.8	69.8	8206	93.4
1989	6483.9	1032.0	72.1	73.2	72.1	72.9	71.7	70.1	6447	73.6
1990	6446.7	1033.0	73.1	73.2	73.1	72.9	71.2	70.2	6528	74.5
1991	8821.6	1035.0	98.0	76.1	98.0	75.8	97.2	73.4	8596	98.1
1992	6400.3	1040.0	73.6	75.9	73.6	75.6	70.1	73.0	6568	74.8
1993	5232.4	1040.0	57.5	74.1	57.5	73.9	57.4	71.6	5205	59.4
1994	8414.5	1040.0	94.2	75.9	94.2	75.6	92.4	73.4	8249	94.2
1995	7432.3	1073.0	81.1	76.3	81.1	76.1	79.0	73.8	7126	81.3
1996	7752.9	1090.0	84.7	76.9	84.7	76.8	81.0	74.4	7434	84.6
1997	9085.3	1090.0	94.5	78.2	94.5	78.0	95.2	75.9	8274	94.5
1998	7652.8	1090.0	81.5	78.4	81.5	78.3	80.1	76.2	7015	80.1
1999	8814.5	1090.0	94.0	79.4	94.0	79.2	92.3	77.2	8234	94.0
2000	8180.6	1090.0	86.5	79.8	86.5	79.7	85.4	77.6	7598	86.5
2001	9413.0	1090.0	99.5	80.9	99.5	80.8	98.6	78.8	8718	99.5
2002	8026.6	1105.0	85.7	81.2	85.7	81.0	83.4	79.1	7493	85.5
2003	9359.9	1105.0	98.0	82.0	98.0	81.9	96.7	79.9	8585	98.0
2004	8027.0	1135.0	84.1	82.1	84.1	82.0	81.2	80.0	7359	83.8
2005	9442.6	1105.0	95.4	82.7	95.4	82.6	97.5	80.8	8357	95.4
2006	8602.7	1135.0	87.2	82.9	87.2	82.8	86.5	81.1	7639	87.2
2007	9456.3	1149.0	95.4	83.5	95.4	83.4	94.0	81.6	8349	95.3
2008	9005.7	1149.0	87.7	83.6	87.7	83.6	89.2	82.0	7704	87.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		25			251	
B. Refuelling without a maintenance					24	
C. Inspection, maintenance or repair combined with refuelling	1052			851		
D. Inspection, maintenance or repair without refuelling				79	17	
E. Testing of plant systems or component	0			61		
H. Nuclear regulatory requirement						28
J. Grid limitation, failure or grid unavailability						7
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				74	39	
S. Fuel management limitation (including high flux tilt, stretch out or coast-down operation)				15		
Subtotal	1052	25	0	1080	331	35
Total	1077			1446		

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		13
13. Reactor Auxiliary System:		1
14. Safety Systems		18
15. Reactor Cooling System:		37
17. Safety I&C Systems (excluding reactor I&C)		9
31. Turbine and auxiliaries	25	81
32. Feedwater and Main Steam System		15
33. Circulating Water System		0
35. All other I&C Systems		3
41. Main Generator System:		15
42. Electrical Power Supply System:		20
XX. Miscellaneous Systems		27
Total	25	239

# US-388 SUSQUEHANNA-2

Operator: PP&amp;L (PENNSYLVANIA POWER &amp; LIGHT CO.)

Contractor: GE (GENERAL ELECTRIC CO.)

## 1. Station Details

Type: BWR

Net Reference Unit Power  
at the beginning of 2008: 1140.0 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 2008

Net Energy Production: 10091.4 GW(e).h

Energy Availability Factor: 100.0%

Load Factor: 100.8%

Operating Factor: 100.0%

Energy Unavailability Factor: 0.0%

Total Off-line Time: 0 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	871.5	812.6	869.1	829.7	858.8	808.9	837.1	841.7	812.0	857.9	827.4	864.6	10091.4
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 (%)	102.7	102.4	102.6	101.1	101.3	98.5	98.7	99.2	98.9	101.1	100.7	101.9	100.8
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	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 02 Nov 1973      Lifetime Generation: 197230.1 GW(e).h

Date of First Criticality: 08 May 1984      Cumulative Energy Availability Factor: 87.5%

Date of Grid Connection: 03 Jul 1984      Cumulative Load Factor: 86.2%

Date of Commercial Operation: 12 Feb 1985      Cumulative Unit Capability Factor: 87.5%

   Cumulative Energy Unavailability Factor: 12.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	6954.3	1032.0	90.6	90.6	90.2	90.2	84.1	84.1	6993	87.2
1986	5458.4	1032.0	63.5	76.5	63.5	76.3	60.4	71.7	5730	65.4
1987	8598.4	1032.0	96.0	83.2	96.0	83.0	95.1	79.7	8431	96.2
1988	5915.2	1034.0	66.3	78.9	66.3	78.8	65.1	76.0	5985	68.1
1989	6777.0	1038.0	76.9	78.5	76.9	78.4	74.5	75.7	6745	77.0
1990	8290.7	1038.0	94.4	81.2	94.4	81.1	91.1	78.3	8143	93.0
1991	7041.4	1041.0	78.4	80.8	78.4	80.7	77.2	78.2	6955	79.4
1992	7186.2	1044.0	80.2	80.7	80.2	80.6	78.4	78.2	7119	81.0
1993	8337.9	1044.0	92.3	82.0	92.3	81.9	91.2	79.6	8094	92.4
1994	6909.8	1073.0	74.7	81.2	74.7	81.2	73.5	79.0	6577	75.1
1995	8192.7	1094.0	87.8	81.9	87.8	81.8	85.5	79.6	7691	87.8
1996	9127.2	1094.0	95.0	83.0	95.0	83.0	95.0	81.0	8346	95.0
1997	7732.6	1094.0	82.4	83.0	82.4	82.9	80.7	80.9	7211	82.3
1998	8820.8	1094.0	93.3	83.7	93.3	83.7	92.0	81.8	8172	93.3
1999	7794.7	1094.0	83.0	83.7	83.0	83.7	81.3	81.7	7268	83.0
2000	9347.2	1094.0	97.8	84.6	97.8	84.6	97.3	82.8	8587	97.8
2001	8397.1	1111.0	87.9	84.8	87.9	84.8	86.9	83.0	7693	87.8
2002	9306.2	1111.0	96.4	85.5	96.4	85.4	95.6	83.7	8439	96.3
2003	8654.7	1140.0	88.2	85.6	88.2	85.6	87.2	83.9	7701	87.9
2004	10057.1	1140.0	100.0	86.4	100.0	86.4	100.4	84.8	8784	100.0
2005	8885.7	1140.0	90.2	86.6	90.2	86.6	89.0	85.0	7900	90.2
2006	9270.9	1140.0	93.1	86.9	93.1	86.9	92.8	85.4	8155	93.1
2007	8781.6	1140.0	88.2	87.0	88.2	86.9	87.9	85.5	7726	88.2
2008	10091.4	1140.0	100.0	87.5	100.0	87.5	100.8	86.2	8784	100.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1984 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					249	
B. Refuelling without a maintenance					5	
C. Inspection, maintenance or repair combined with refuelling	747					
D. Inspection, maintenance or repair without refuelling	46	0				
E. Testing of plant systems or component	77					
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)		10				
Subtotal	0	0	0	870	264	1
Total	0			1135		

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

System	2008 Hours Lost	1984 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		19
12. Reactor I&C Systems		8
13. Reactor Auxiliary Systems		6
14. Safety Systems		5
15. Reactor Cooling Systems		17
31. Turbine and auxiliaries		21
32. Feedwater and Main Steam System		28
41. Main Generator Systems		30
42. Electrical Power Supply Systems		53
XX. Miscellaneous Systems		37
Total	0	224

# US-289 THREE MILE ISLAND-1

**Operator:** AMERGENE (AMERGEN ENERGY GENERATING CO.)

**Contractor:** B&W (BABCOCK & WILCOX CO.)

## 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 786.0 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 2008

**Net Energy Production:** 7365.1 GW(e).h  
**Energy Availability Factor:** 100.0%  
**Load Factor:** 106.7%  
**Operating Factor:** 100.0%  
**Energy Unavailability Factor:** 0.0%  
**Total Off-line Time:** 0 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	634.5	594.0	631.9	606.2	622.7	593.7	611.8	616.0	591.2	620.4	610.6	632.2	7365.1
<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>	108.5	108.6	108.2	107.1	106.5	104.9	104.6	105.3	104.5	106.1	107.7	108.1	106.7
<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. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 18 May 1968  
**Date of First Criticality:** 05 Jun 1974  
**Date of Grid Connection:** 19 Jun 1974  
**Date of Commercial Operation:** 02 Sep 1974

**Lifetime Generation:** 172337.8 GW(e).h  
**Cumulative Energy Availability Factor:** 72.2%  
**Cumulative Load Factor:** 72.5%  
**Cumulative Unit Capability Factor:** 86.6%  
**Cumulative Energy Unavailability Factor:** 27.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1974	1992.4	789.0	88.2	88.2	88.2	88.2	85.9	85.9	2584	88.3
1975	5541.6	792.0	79.7	81.8	79.7	81.8	79.9	81.4	7198	82.2
1976	4344.4	792.0	62.5	73.5	62.5	73.5	62.4	73.3	5745	65.4
1977	5466.6	792.0	78.7	75.1	78.7	75.1	78.8	74.9	7087	80.9
1978	5681.9	788.0	82.0	76.7	82.0	76.7	82.3	76.6	7454	85.1
1979	888.7	776.0	12.9	64.9	12.9	64.9	13.1	64.9	1128	12.9
1980	0.0	776.0	100.0	70.4	0.0	54.8	0.0	54.8	0	0.0
1981	0.0	776.0	100.0	74.4	0.0	47.4	0.0	47.4	0	0.0
1982	0.0	776.0	100.0	77.4	0.0	41.8	0.0	41.8	0	0.0
1983	0.0	776.0	100.0	79.8	0.0	37.3	0.0	37.3	0	0.0
1984	0.0	776.0	100.0	81.8	0.0	33.8	0.0	33.7	0	0.0
1985	811.7	776.0	37.8	77.9	37.8	34.1	11.9	31.8	1853	21.2
1986	4818.3	776.0	70.8	77.3	70.8	37.1	70.9	35.0	6209	70.9
1987	5034.3	776.0	72.5	77.0	72.5	39.7	74.1	37.9	6351	72.5
1988	5465.4	784.0	76.0	76.9	76.0	42.2	79.4	40.8	6679	76.0
1989	7216.8	808.0	99.5	78.4	99.5	46.1	102.0	44.9	8714	99.5
1990	5316.2	808.0	81.8	78.6	81.8	48.3	75.1	46.8	7123	81.3
1991	5671.2	808.0	86.4	79.1	86.4	50.6	80.1	48.8	7536	86.0
1992	6936.5	789.0	99.5	80.2	99.5	53.3	100.0	51.6	8743	99.5
1993	5962.2	786.0	88.0	80.6	88.0	55.1	86.6	53.4	7702	87.9
1994	6590.9	786.0	95.3	81.3	95.3	57.1	95.7	55.5	8349	95.3
1995	6388.0	786.0	90.5	81.8	90.5	58.6	92.8	57.2	7926	90.5
1996	7100.3	786.0	100.0	82.6	100.0	60.5	102.8	59.3	8784	100.0
1997	5918.8	786.0	87.3	82.8	87.3	61.6	86.0	60.4	7633	87.1
1998	7059.2	786.0	100.0	83.5	100.0	63.2	102.5	62.2	8760	100.0
1999	6328.4	786.0	89.4	83.7	89.4	64.2	91.9	63.3	7827	89.3
2000	7144.9	786.0	100.0	84.4	100.0	65.6	103.5	64.9	8784	100.0
2001	5416.7	786.0	80.3	84.2	80.3	66.1	78.7	65.4	7034	80.3
2002	7313.5	802.0	100.0	84.8	100.0	67.4	104.6	66.8	8760	100.0
2003	6205.1	802.0	86.7	84.8	86.7	68.0	88.3	67.5	7602	86.8
2004	7273.3	802.0	100.0	85.3	100.0	69.1	103.2	68.7	8784	100.0
2005	6755.4	786.0	93.0	85.6	93.0	69.9	98.1	69.7	8145	93.0
2006	7227.0	786.0	99.1	86.0	98.7	70.8	105.0	70.7	8647	98.7
2007	6645.3	786.0	91.7	86.2	91.7	71.4	96.5	71.5	8034	91.7
2008	7365.1	786.0	100.0	86.6	100.0	72.2	106.7	72.5	8784	100.0



## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1974 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					122	
B. Refuelling without a maintenance					9	
C. Inspection, maintenance or repair combined with refuelling				593		
D. Inspection, maintenance or repair without refuelling				65	1	
E. Testing of plant systems or component				9	0	
H. Nuclear regulatory requirement					193	1692
J. Grid limitation, failure or grid unavailability						1
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	
Subtotal	0	0	0	667	326	1693
Total	0			2686		

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

System	2008 Hours Lost	1974 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		24
13. Reactor Auxiliary System:		9
15. Reactor Cooling System:		30
16. Steam generation system:		6
31. Turbine and auxiliaries		26
32. Feedwater and Main Steam System		6
35. All other I&C Systems		0
41. Main Generator System:		7
42. Electrical Power Supply System:		3
XX. Miscellaneous Systems		0
Total	0	111

## US-250 TURKEY POINT-3

**Operator:** FPL (FLORIDA POWER & LIGHT CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 693.0 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 2008

**Net Energy Production:** 6139.5 GW(e).h  
**Energy Availability Factor:** 98.1%  
**Load Factor:** 100.9%  
**Operating Factor:** 98.1%  
**Energy Unavailability Factor:** 1.9%  
**Total Off-line Time:** 167 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	542.5	440.6	484.4	519.4	527.8	476.2	521.2	521.3	509.9	532.5	523.4	540.2	6139.5
<b>EAF (%)</b>	100.0	88.1	91.5	100.0	100.0	97.3	100.0	100.0	100.0	100.0	100.0	100.0	98.1
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	97.3	100.0	100.0	100.0	100.0	100.0	100.0	99.8
<b>LF (%)</b>	105.2	91.4	94.1	104.1	102.4	95.4	101.1	101.1	102.2	103.3	104.8	104.8	100.9
<b>OF (%)</b>	100.0	88.1	91.4	100.0	100.0	97.2	100.0	100.0	100.0	100.0	100.0	100.0	98.1
<b>EUF (%)</b>	0.0	11.9	8.5	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	1.9
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0
<b>XUF (%)</b>	0.0	11.9	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

<b>Date of Construction Start:</b>	27 Apr 1967	<b>Lifetime Generation:</b>	159419.5 GW(e).h
<b>Date of First Criticality:</b>	20 Oct 1972	<b>Cumulative Energy Availability Factor:</b>	77.7%
<b>Date of Grid Connection:</b>	02 Nov 1972	<b>Cumulative Load Factor:</b>	73.2%
<b>Date of Commercial Operation:</b>	14 Dec 1972	<b>Cumulative Unit Capability Factor:</b>	77.8%
		<b>Cumulative Energy Unavailability Factor:</b>	22.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	75.0	670.0	100.0	100.0	100.0	100.0	14.5	14.5	304	40.9
1973	0.0	666.0	100.0	100.0	100.0	100.0	0.0	1.2	0	0.0
1974	3478.8	666.0	100.0	100.0	100.0	100.0	59.6	29.2	6090	69.5
1975	4376.0	666.0	74.9	91.9	74.9	91.9	75.0	44.0	6948	79.3
1976	4322.0	666.0	73.9	87.5	73.9	87.5	73.9	51.3	6665	75.9
1977	4474.1	666.0	76.6	85.3	76.6	85.3	76.7	56.3	6994	79.8
1978	4502.7	666.0	77.2	84.0	77.2	84.0	77.2	59.7	7087	80.9
1979	2881.6	666.0	49.4	79.1	49.4	79.1	49.4	58.3	4509	51.5
1980	4389.0	657.0	77.9	79.0	77.9	79.0	76.1	60.5	6812	77.6
1981	933.2	646.0	13.2	71.9	13.2	71.9	16.5	55.7	1385	15.8
1982	3771.4	646.0	64.2	71.2	64.2	71.2	66.6	56.8	5612	64.1
1983	4331.0	659.0	73.3	71.4	73.3	71.4	75.0	58.4	6415	73.2
1984	4784.2	666.0	82.6	72.3	82.6	72.3	81.8	60.4	7253	82.6
1985	3421.0	666.0	61.0	71.4	59.7	71.3	58.6	60.3	5224	59.6
1986	4513.1	666.0	77.9	71.9	77.9	71.8	77.4	61.5	6816	77.8
1987	885.3	666.0	17.9	68.3	17.9	68.2	15.2	58.4	1566	17.9
1988	3468.0	666.0	60.6	67.8	60.6	67.7	59.3	58.4	5320	60.6
1989	3605.1	666.0	65.1	67.7	65.1	67.6	61.8	58.6	5696	65.0
1990	3388.4	666.0	59.4	67.2	59.4	67.1	58.1	58.6	5200	59.4
1991	1332.0	666.0	50.0	66.3	50.0	66.2	22.8	56.7	2155	24.6
1992	3428.2	666.0	67.2	66.3	67.2	66.3	58.6	56.8	5896	67.1
1993	5657.3	666.0	96.1	67.8	96.1	67.7	97.0	58.7	8421	96.1
1994	4924.9	666.0	85.8	68.6	85.8	68.5	84.4	59.9	7513	85.8
1995	5219.0	666.0	89.6	69.5	89.6	69.4	89.5	61.2	7846	89.6
1996	5750.8	673.0	96.7	70.6	96.7	70.6	97.3	62.7	8490	96.7
1997	5252.4	693.0	87.0	71.3	87.0	71.3	86.5	63.7	7570	86.4
1998	5408.3	693.0	89.8	72.1	89.0	72.0	89.1	64.7	7757	88.6
1999	6112.3	693.0	99.1	73.1	99.1	73.0	100.7	66.1	8684	99.1
2000	5684.4	693.0	92.5	73.8	92.5	73.7	93.4	67.1	8122	92.5
2001	5526.0	693.0	90.5	74.4	90.5	74.3	91.0	67.9	7923	90.4
2002	6215.4	693.0	100.0	75.3	100.0	75.2	102.4	69.1	8760	100.0
2003	5445.6	693.0	90.6	75.8	90.6	75.7	89.7	69.8	7930	90.5
2004	4734.0	693.0	79.0	75.9	79.0	75.8	77.8	70.1	6934	78.9
2005	5798.9	693.0	96.4	76.5	95.5	76.4	95.5	70.9	8362	95.5
2006	5581.9	693.0	90.3	76.9	90.3	76.9	91.9	71.5	7905	90.2
2007	6078.1	693.0	83.6	77.1	83.6	77.1	100.1	72.3	7320	83.6
2008	6139.5	693.0	99.8	77.8	98.1	77.7	100.9	73.2	8617	98.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure				0	451	
B. Refuelling without a maintenance					4	
C. Inspection, maintenance or repair combined with refuelling				866		
D. Inspection, maintenance or repair without refuelling	19			315		
E. Testing of plant systems or component				9	1	
F. Major back-fitting, refurbishment or upgrading activities with refuelling				3		
J. Grid limitation, failure or grid unavailability			146			
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				279	17	6
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
P. Fire					2	
Z. Others					0	
Subtotal	19	0	146	1472	475	8
Total		165			1955	

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		49
13. Reactor Auxiliary System:		55
14. Safety Systems		20
15. Reactor Cooling System:		81
16. Steam generation system:		22
17. Safety I&C Systems (excluding reactor I&C)		1
31. Turbine and auxiliaries		39
32. Feedwater and Main Steam System		30
33. Circulating Water System		1
35. All other I&C Systems		2
41. Main Generator System:		77
42. Electrical Power Supply System:		10
XX. Miscellaneous Systems		46
Total	0	433

## US-251 TURKEY POINT-4

**Operator:** FPL (FLORIDA POWER & LIGHT CO.)

**Contractor:** WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

### 1. Station Details

**Type:** PWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 693.0 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 2008

**Net Energy Production:** 5234.9 GW(e).h  
**Energy Availability Factor:** 84.4%  
**Load Factor:** 86.0%  
**Operating Factor:** 84.4%  
**Energy Unavailability Factor:** 15.6%  
**Total Off-line Time:** 1369 hours

### 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	539.7	437.9	494.7	0.0	303.1	509.9	522.6	378.0	511.0	469.3	526.1	542.7	5234.9
<b>EAF (%)</b>	100.0	88.1	95.3	0.0	65.9	100.0	100.0	74.0	100.0	89.0	100.0	100.0	84.4
<b>UCF (%)</b>	100.0	97.3	95.3	0.0	65.9	100.0	100.0	74.0	100.0	89.0	100.0	100.0	85.2
<b>LF (%)</b>	104.7	90.8	96.1	0.0	58.8	102.2	101.4	73.3	102.4	91.0	105.3	105.3	86.0
<b>OF (%)</b>	100.0	88.1	95.3	0.0	65.9	100.0	100.0	73.9	100.0	88.8	100.0	100.0	84.4
<b>EUF (%)</b>	0.0	11.9	4.7	100.0	34.1	0.0	0.0	26.0	0.0	11.0	0.0	0.0	15.6
<b>PUF (%)</b>	0.0	0.0	3.2	100.0	34.1	0.0	0.0	26.0	0.0	11.0	0.0	0.0	14.5
<b>UCLF (%)</b>	0.0	2.8	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
<b>XUF (%)</b>	0.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7

UCLF replaces previously used UUF.

### 4. 2008 Summary of Operation

## 5. Historical Summary

**Date of Construction Start:** 27 Apr 1967  
**Date of First Criticality:** 11 Jun 1973  
**Date of Grid Connection:** 21 Jun 1973  
**Date of Commercial Operation:** 07 Sep 1973

**Lifetime Generation:** 154866.5 GW(e).h  
**Cumulative Energy Availability Factor:** 77.0%  
**Cumulative Load Factor:** 73.5%  
**Cumulative Unit Capability Factor:** 77.0%  
**Cumulative Energy Unavailability Factor:** 23.0%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1973	0.0	666.0	100.0	100.0	100.0	100.0	0.0	0.0	0	0.0
1974	4513.4	728.0	100.0	100.0	100.0	100.0	70.8	54.2	6759	77.2
1975	3991.9	666.0	68.3	87.0	68.3	87.0	68.4	60.1	6172	70.5
1976	3774.8	666.0	64.3	80.3	64.3	80.3	64.5	61.4	5825	66.3
1977	3671.0	666.0	62.7	76.4	62.7	76.4	62.9	61.7	5578	63.7
1978	3791.4	666.0	65.0	74.3	65.0	74.3	65.0	62.3	6693	76.4
1979	3846.6	666.0	65.9	73.0	65.9	73.0	65.9	62.9	6361	72.6
1980	3856.5	657.0	69.4	72.5	69.4	72.5	66.8	63.4	6093	69.4
1981	4507.2	646.0	77.3	73.1	77.3	73.1	79.6	65.3	6801	77.6
1982	3847.2	646.0	66.3	72.4	66.3	72.4	68.0	65.6	5806	66.3
1983	2978.9	659.0	52.4	70.5	52.4	70.5	51.6	64.2	4568	52.1
1984	3084.1	666.0	54.4	69.0	54.4	69.0	52.7	63.2	4774	54.3
1985	5177.9	666.0	89.8	70.7	89.7	70.7	88.8	65.3	7852	89.6
1986	1744.0	666.0	31.9	67.8	31.9	67.8	29.9	62.6	2790	31.8
1987	2657.5	666.0	49.3	66.5	49.3	66.5	45.6	61.4	4314	49.2
1988	3267.7	666.0	56.8	65.9	56.8	65.9	55.9	61.1	4986	56.8
1989	2107.6	666.0	42.0	64.4	42.0	64.4	36.1	59.5	3676	42.0
1990	4384.9	666.0	76.4	65.1	76.4	65.1	75.2	60.4	6692	76.4
1991	808.0	666.0	48.2	64.2	48.2	64.2	13.9	57.9	1335	15.2
1992	4642.3	666.0	81.3	65.1	81.3	65.1	79.4	59.0	7139	81.3
1993	4746.3	666.0	83.1	66.0	83.1	66.0	81.4	60.1	7277	83.1
1994	4844.4	666.0	85.0	66.9	85.0	66.9	83.0	61.2	7437	84.9
1995	5780.1	666.0	98.5	68.3	98.5	68.3	99.1	62.9	8629	98.5
1996	5165.4	673.0	88.6	69.2	88.6	69.2	87.4	63.9	7771	88.5
1997	5442.6	693.0	89.6	70.0	89.6	70.0	89.7	65.0	7809	89.1
1998	6181.5	693.0	100.0	71.3	100.0	71.2	101.8	66.5	8760	100.0
1999	5735.3	693.0	93.4	72.1	93.4	72.1	94.5	67.6	8185	93.4
2000	5591.4	693.0	91.4	72.9	91.4	72.9	91.9	68.6	8028	91.4
2001	6105.3	693.0	98.4	73.8	98.4	73.8	100.6	69.7	8623	98.4
2002	5854.1	693.0	95.6	74.6	95.6	74.5	96.4	70.7	8369	95.5
2003	5562.5	693.0	91.7	75.1	91.7	75.1	91.6	71.4	8033	91.7
2004	6079.2	693.0	98.6	75.9	98.6	75.9	99.9	72.3	8662	98.6
2005	4241.0	693.0	72.4	75.8	71.3	75.8	69.9	72.2	6243	71.3
2006	5383.7	693.0	87.6	76.2	87.6	76.1	88.7	72.7	7669	87.5
2007	5148.8	693.0	97.6	76.8	97.6	76.8	84.8	73.1	8552	97.6
2008	5234.9	693.0	85.2	77.0	84.4	77.0	86.0	73.5	7415	84.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1975 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		30			389	
B. Refuelling without a maintenance outage					12	
C. Inspection, maintenance or repair combined with refuelling	997			1238		
D. Inspection, maintenance or repair without refuelling	275			128		
E. Testing of plant systems or component				7		
H. Nuclear regulatory requirement				170		
J. Grid limitation, failure or grid unavailability			63			0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					149	0
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						2
Subtotal	1272	30	63	1543	550	2
Total		1365			2095	

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

System	2008 Hours Lost	1975 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		7
12. Reactor I&C Systems		21
13. Reactor Auxiliary Systems		3
14. Safety Systems		4
15. Reactor Cooling System		102
16. Steam generation system	30	105
31. Turbine and auxiliaries		62
32. Feedwater and Main Steam System		21
33. Circulating Water System		3
35. All other I&C Systems		2
41. Main Generator System		1
42. Electrical Power Supply System		49
Total	30	380

# US-271 VERMONT YANKEE

**Operator:** ENTERGY (ENTERGY NUCLEAR)

**Contractor:** GE (GENERAL ELECTRIC CO.)

## 1. Station Details

**Type:** BWR  
**Net Reference Unit Power**  
**at the beginning of 2008:** 620.0 MW(e)  
**Design Net Capacity:** 514.0 MW(e)  
**Design Discharge Burnup:** 33760 MW.d/t  
**Status at end of year:** Operational

## 2. Production Summary 2008

**Net Energy Production:** 4895.1 GW(e).h  
**Energy Availability Factor:** 94.0%  
**Load Factor:** 89.9%  
**Operating Factor:** 94.0%  
**Energy Unavailability Factor:** 6.0%  
**Total Off-line Time:** 531 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>GW(e).h</b>	467.0	435.1	457.4	421.7	454.9	426.8	353.7	450.5	416.1	254.9	296.6	460.4	4895.1
<b>EAF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	58.1	69.7	100.0	94.0
<b>UCF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	58.1	69.7	100.0	94.0
<b>LF (%)</b>	101.2	100.8	99.3	94.5	98.6	95.6	76.7	97.7	93.2	55.2	66.4	99.8	89.9
<b>OF (%)</b>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	58.1	69.6	100.0	94.0
<b>EUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.9	30.3	0.0	6.0
<b>PUF (%)</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.9	30.3	0.0	6.0
<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. 2008 Summary of Operation



## 5. Historical Summary

<b>Date of Construction Start:</b>	11 Dec 1967	<b>Lifetime Generation:</b>	133336.7 GW(e).h
<b>Date of First Criticality:</b>	24 Mar 1972	<b>Cumulative Energy Availability Factor:</b>	84.2%
<b>Date of Grid Connection:</b>	20 Sep 1972	<b>Cumulative Load Factor:</b>	81.9%
<b>Date of Commercial Operation:</b>	30 Nov 1972	<b>Cumulative Unit Capability Factor:</b>	84.3%
		<b>Cumulative Energy Unavailability Factor:</b>	15.8%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1972	291.4	502.0	100.0	100.0	100.0	100.0	38.7	38.7	963	65.8
1973	1814.5	468.0	70.3	74.9	70.3	74.9	44.3	43.4	5354	61.1
1974	2482.7	514.0	55.4	65.5	55.4	65.5	55.1	49.1	6495	74.1
1975	3561.3	504.0	80.5	70.3	80.5	70.3	80.7	59.2	7689	87.8
1976	3260.2	504.0	73.5	71.1	73.5	71.1	73.6	62.7	6776	77.1
1977	3537.9	504.0	79.8	72.8	79.8	72.8	80.1	66.1	7456	85.1
1978	3240.7	504.0	73.4	72.9	73.4	72.9	73.4	67.3	6649	75.9
1979	3449.0	504.0	77.4	73.5	77.4	73.5	78.1	68.8	7194	82.1
1980	2978.8	504.0	73.2	73.5	72.0	73.3	67.3	68.6	6271	71.4
1981	3568.5	504.0	84.8	74.7	84.8	74.6	80.8	70.0	7407	84.6
1982	4174.3	504.0	96.7	76.9	96.7	76.8	94.5	72.4	8406	96.0
1983	2874.5	504.0	69.8	76.3	69.8	76.2	65.1	71.7	6072	69.3
1984	3335.8	504.0	79.0	76.5	79.0	76.4	75.3	72.0	6933	78.9
1985	2999.4	504.0	71.8	76.1	71.8	76.0	67.9	71.7	6287	71.8
1986	2058.4	504.0	48.9	74.2	48.9	74.1	46.6	69.9	4280	48.9
1987	3536.4	504.0	83.2	74.8	83.2	74.7	80.1	70.6	7288	83.2
1988	4113.8	504.0	94.9	76.0	94.9	76.0	92.9	72.0	8333	94.9
1989	3606.8	504.0	84.4	76.5	84.4	76.5	81.7	72.6	7372	84.2
1990	3616.3	504.0	84.7	77.0	84.7	76.9	81.9	73.1	7392	84.4
1991	4108.3	504.0	95.1	77.9	93.7	77.8	93.1	74.1	8200	93.6
1992	3734.6	504.0	87.6	78.4	87.6	78.3	84.4	74.6	7680	87.4
1993	3372.1	504.0	78.6	78.4	78.6	78.3	76.4	74.7	6860	78.3
1994	4315.6	504.0	98.2	79.3	98.2	79.2	97.7	75.8	8600	98.2
1995	3858.5	507.0	86.6	79.6	86.6	79.5	86.8	76.2	7554	86.2
1996	3798.8	510.0	84.9	79.9	84.9	79.8	84.8	76.6	7422	84.5
1997	4266.9	510.0	95.6	80.5	95.6	80.4	95.5	77.4	8358	95.4
1998	3358.7	510.0	76.6	80.3	76.6	80.2	75.2	77.3	6690	76.4
1999	4059.1	510.0	90.5	80.7	90.5	80.6	90.9	77.8	7936	90.6
2000	4548.1	510.0	99.5	81.4	99.5	81.3	101.5	78.6	8738	99.5
2001	4171.1	510.0	93.1	81.8	93.1	81.7	93.4	79.1	8145	93.0
2002	3962.6	510.0	91.0	82.1	91.0	82.0	88.7	79.5	7966	90.9
2003	4444.2	510.0	98.3	82.6	98.3	82.6	99.5	80.1	8612	98.3
2004	3858.0	510.0	86.6	82.8	86.6	82.7	86.1	80.3	7599	86.5
2005	4106.4	506.0	93.8	83.1	93.8	83.0	92.6	80.7	8212	93.7
2006	5106.6	557.0	100.0	83.6	100.0	83.6	104.5	81.4	8760	100.0
2007	4703.7	620.0	92.6	83.9	92.6	83.9	86.6	81.6	8114	92.6
2008	4895.1	620.0	94.0	84.3	94.0	84.2	89.9	81.9	8253	94.0

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1972 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					242	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	529			884		
D. Inspection, maintenance or repair without refuelling				114	0	
E. Testing of plant systems or component:				6	11	
H. Nuclear regulatory requirement						5
K. Load-following (frequency control reserve shutdown due to reduced energy demand)				21		5
Subtotal	529	0	0	1025	260	10
Total	529			1295		

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

System	2008 Hours Lost	1972 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		8
12. Reactor I&C Systems		6
13. Reactor Auxiliary System:		17
14. Safety Systems		47
15. Reactor Cooling System:		40
31. Turbine and auxiliaries		41
32. Feedwater and Main Steam System		19
42. Electrical Power Supply System:		60
XX. Miscellaneous Systems		1
Total	0	239

# US-395 VIRGIL C. SUMMER-1

Operator: SCEG (SOUTH CAROLINA ELECTRIC &amp; GAS CO.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 966.0 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 2008

Net Energy Production: 7178.1 GW(e).h  
 Energy Availability Factor: 84.3%  
 Load Factor: 84.6%  
 Operating Factor: 84.3%  
 Energy Unavailability Factor: 15.7%  
 Total Off-line Time: 1380 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	557.0	651.7	727.9	574.7	0.0	358.2	723.1	721.8	700.5	727.5	706.5	729.3	7178.1
EAF (%)	76.4	97.2	100.0	83.3	0.0	55.8	100.0	100.0	100.0	100.0	100.0	100.0	84.3
UCF (%)	76.4	97.2	100.0	83.3	0.0	55.8	100.0	100.0	100.0	100.0	100.0	100.0	84.3
LF (%)	77.5	96.9	101.4	82.6	0.0	51.5	100.6	100.4	100.7	101.2	101.4	101.5	84.6
OF (%)	76.3	97.1	100.0	83.2	0.0	55.7	100.0	100.0	100.0	100.0	100.0	100.0	84.3
EUF (%)	23.6	2.8	0.0	16.7	100.0	44.2	0.0	0.0	0.0	0.0	0.0	0.0	15.7
PUF (%)	0.0	0.0	0.0	16.7	100.0	44.2	0.0	0.0	0.0	0.0	0.0	0.0	13.5
UCLF (%)	23.7	2.8	0.0	0.0	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 21 Mar 1973      Lifetime Generation: 170605.0 GW(e).h  
 Date of First Criticality: 22 Oct 1982      Cumulative Energy Availability Factor: 84.6%  
 Date of Grid Connection: 16 Nov 1982      Cumulative Load Factor: 82.0%  
 Date of Commercial Operation: 01 Jan 1984      Cumulative Unit Capability Factor: 84.6%  
    Cumulative Energy Unavailability Factor: 15.4%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1984	4208.6	900.0	61.3	61.3	61.3	61.3	53.2	53.2	5362	61.0
1985	5235.1	885.0	71.6	66.4	71.6	66.4	67.5	60.3	6272	71.6
1986	7160.6	885.0	95.3	76.0	95.3	76.0	92.4	70.9	8346	95.3
1987	5168.1	885.0	70.1	74.5	70.1	74.5	66.7	69.9	6135	70.0
1988	5068.2	885.0	67.8	73.2	67.8	73.2	65.2	68.9	5952	67.8
1989	5412.8	885.0	80.8	74.4	80.8	74.4	69.8	69.1	7073	80.7
1990	6117.3	885.0	82.9	75.6	82.9	75.6	78.9	70.5	7261	82.9
1991	5346.1	885.0	80.7	76.3	80.7	76.3	69.0	70.3	7065	80.7
1992	7515.2	885.0	97.1	78.6	97.1	78.6	96.7	73.2	8532	97.1
1993	6109.5	885.0	82.9	79.0	82.9	79.0	78.8	73.8	7258	82.9
1994	4456.0	885.0	68.8	78.1	68.8	78.1	57.5	72.3	6022	68.7
1995	7561.4	885.0	96.8	79.6	96.8	79.6	97.5	74.4	8478	96.8
1996	7155.1	923.0	89.6	80.4	89.6	80.4	88.2	75.5	7829	89.1
1997	7267.9	948.0	89.9	81.2	89.9	81.2	87.5	76.4	7805	89.1
1998	8188.9	953.0	98.7	82.4	98.7	82.4	98.1	77.9	8638	98.6
1999	7376.3	954.0	88.8	82.8	88.8	82.8	88.3	78.6	7779	88.8
2000	6358.8	965.0	76.2	82.4	76.2	82.4	75.0	78.4	6688	76.1
2001	6757.5	966.0	81.0	82.3	81.0	82.3	79.9	78.5	7095	81.0
2002	7379.5	966.0	87.3	82.6	87.3	82.6	87.2	79.0	7645	87.3
2003	7352.1	966.0	86.4	82.8	86.4	82.8	86.9	79.4	7564	86.3
2004	8243.3	966.0	95.8	83.5	95.8	83.5	97.1	80.3	8413	95.8
2005	7469.4	966.0	88.4	83.7	88.4	83.7	88.3	80.7	7746	88.4
2006	7521.4	966.0	88.9	83.9	88.9	83.9	88.9	81.0	7783	88.8
2007	8479.0	966.0	99.5	84.6	99.5	84.6	100.2	81.9	8719	99.5
2008	7178.1	966.0	84.3	84.6	84.3	84.6	84.6	82.0	7404	84.3

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1983 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		195		9	145	
B. Refuelling without a maintenance					11	
C. Inspection, maintenance or repair combined with refuelling	1181			977		
D. Inspection, maintenance or repair without refuelling				164		
E. Testing of plant systems or component:	1			3	0	
J. Grid limitation, failure or grid unavailability						0
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					37	1
Subtotal	1182	195	0	1153	193	1
Total		1377			1347	

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

System	2008 Hours Lost	1983 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		16
14. Safety Systems		5
15. Reactor Cooling System:		49
16. Steam generation system:	195	13
31. Turbine and auxiliaries		13
32. Feedwater and Main Steam System		14
35. All other I&C Systems		1
41. Main Generator System:		17
42. Electrical Power Supply System:		11
Total	195	139

# US-424 VOGTLE-1

Operator: SOUTH (Southern Nuclear Operating Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1109.0 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 2008

Net Energy Production: 9050.4 GW(e).h  
 Energy Availability Factor: 89.1%  
 Load Factor: 92.9%  
 Operating Factor: 89.1%  
 Energy Unavailability Factor: 10.9%  
 Total Off-line Time: 956 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	856.3	799.0	383.1	123.1	874.9	837.6	864.4	864.2	837.9	874.4	854.4	881.1	9050.4
EAF (%)	100.0	100.0	48.6	20.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.1
UCF (%)	100.0	100.0	48.6	20.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.1
LF (%)	103.8	103.5	46.5	15.4	106.0	104.9	104.8	104.7	104.9	106.0	106.9	106.8	92.9
OF (%)	100.0	100.0	48.6	20.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.1
EUF (%)	0.0	0.0	51.4	79.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9
PUF (%)	0.0	0.0	51.4	79.7	0.0	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	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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Aug 1976      Lifetime Generation: 187667.4 GW(e).h  
 Date of First Criticality: 09 Mar 1987      Cumulative Energy Availability Factor: 89.8%  
 Date of Grid Connection: 27 Mar 1987      Cumulative Load Factor: 89.8%  
 Date of Commercial Operation: 01 Jun 1987      Cumulative Unit Capability Factor: 89.9%  
    Cumulative Energy Unavailability Factor: 10.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1987	Data not provided									
1988	6799.7	1079.0	74.2	74.2	74.2	74.2	71.7	71.7	6569	74.8
1989	8709.4	1083.0	94.2	84.2	94.2	84.2	91.8	81.8	8275	94.5
1990	7353.1	1079.0	78.4	82.3	78.4	82.3	77.8	80.5	6980	79.7
1991	7501.7	1100.0	78.9	81.4	78.9	81.4	77.9	79.8	7016	80.1
1992	9383.5	1105.0	96.9	84.6	96.9	84.6	96.7	83.2	8523	97.0
1993	8600.7	1145.0	86.3	84.9	86.3	84.9	85.7	83.7	7577	86.5
1994	8817.2	1168.0	89.6	85.6	89.6	85.6	86.1	84.0	7847	89.6
1995	9984.0	1162.0	99.2	87.4	98.4	87.3	98.1	85.9	8621	98.4
1996	8149.8	1162.0	81.5	86.7	81.5	86.6	79.8	85.2	7162	81.5
1997	8270.1	1162.0	81.9	86.2	81.9	86.1	81.2	84.8	7167	81.8
1998	10216.9	1162.0	99.8	87.5	99.8	87.4	100.4	86.2	8738	99.7
1999	9425.9	1152.0	92.6	87.9	92.6	87.8	93.3	86.8	8108	92.6
2000	9196.6	1148.0	90.7	88.1	90.7	88.1	91.2	87.2	7963	90.7
2001	10144.4	1148.0	98.9	88.9	98.9	88.8	100.9	88.2	8665	98.9
2002	8638.8	1148.0	85.3	88.6	85.3	88.6	85.9	88.0	7469	85.3
2003	9411.5	1152.0	92.5	88.9	92.5	88.8	93.3	88.3	8097	92.4
2004	10162.3	1152.0	99.0	89.5	99.0	89.5	100.4	89.1	8694	99.0
2005	9220.1	1152.0	90.9	89.6	90.9	89.5	91.4	89.2	7964	90.9
2006	8671.1	1152.0	86.0	89.4	86.0	89.3	85.9	89.0	7536	86.0
2007	9960.3	1109.0	100.0	89.9	100.0	89.9	102.5	89.7	8760	100.0
2008	9050.4	1109.0	89.1	89.9	89.1	89.8	92.9	89.8	7828	89.1

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1988 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					140	
B. Refuelling without a maintenance					14	
C. Inspection, maintenance or repair combined with refuelling	955			633		
D. Inspection, maintenance or repair without refuelling				27		
E. Testing of plant systems or component				3		
H. Nuclear regulatory requirement					9	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					1	3
Z. Others				2		
Subtotal	955	0	0	665	164	3
Total		955			832	

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

System	2008 Hours Lost	1988 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		4
14. Safety Systems		27
15. Reactor Cooling System:		35
17. Safety I&C Systems (excluding reactor I&C)		10
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		16
35. All other I&C Systems		2
41. Main Generator System:		23
42. Electrical Power Supply System:		12
Total	0	130

# US-425 VOGTLE-2

Operator: SOUTH (Southern Nuclear Operating Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1127.0 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 2008

Net Energy Production: 8727.1 GW(e).h  
 Energy Availability Factor: 88.4%  
 Load Factor: 88.2%  
 Operating Factor: 88.4%  
 Energy Unavailability Factor: 11.6%  
 Total Off-line Time: 1017 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	866.3	808.5	859.6	827.4	850.8	814.5	840.2	840.3	321.8	165.6	647.3	884.9	8727.1
EAF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	44.2	36.9	79.9	100.0	88.4
UCF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	44.2	36.9	79.9	100.0	88.4
LF (%)	103.3	103.1	102.7	102.0	101.5	100.4	100.2	100.2	39.7	19.8	79.7	105.5	88.2
OF (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	44.2	36.8	79.9	100.0	88.4
EUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.8	63.1	20.1	0.0	11.6
PUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.8	63.1	20.1	0.0	11.6
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 01 Aug 1976      Lifetime Generation: 175092.2 GW(e).h  
 Date of First Criticality: 28 Mar 1989      Cumulative Energy Availability Factor: 89.8%  
 Date of Grid Connection: 10 Apr 1989      Cumulative Load Factor: 89.2%  
 Date of Commercial Operation: 20 May 1989      Cumulative Unit Capability Factor: 89.8%  
    Cumulative Energy Unavailability Factor: 10.2%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1989	5547.2	1110.0	93.8	93.8	93.8	93.8	94.4	94.4	5104	94.1
1990	6868.0	1110.0	81.1	85.9	81.1	85.9	70.6	79.6	7125	81.3
1991	8897.4	1097.0	95.4	89.5	95.4	89.5	92.6	84.5	8375	95.6
1992	7779.6	1109.0	80.8	87.1	80.8	87.1	79.9	83.2	7175	81.7
1993	8680.9	1140.0	88.1	87.3	88.1	87.3	86.9	84.0	7737	88.3
1994	9331.6	1168.0	92.1	88.2	92.1	88.2	91.2	85.4	8062	92.0
1995	9165.6	1162.0	90.8	88.6	90.3	88.5	90.0	86.1	7908	90.3
1996	9037.6	1162.0	89.9	88.8	89.9	88.7	88.5	86.4	7899	89.9
1997	10310.8	1162.0	100.0	90.1	100.0	90.1	101.3	88.2	8760	100.0
1998	8388.6	1162.0	83.9	89.5	83.9	89.4	82.4	87.6	7347	83.9
1999	9022.6	1156.0	89.5	89.5	89.5	89.4	89.1	87.7	7833	89.4
2000	10337.8	1149.0	100.0	90.4	100.0	90.3	102.4	89.0	8784	100.0
2001	9456.7	1149.0	92.6	90.5	92.6	90.5	94.0	89.4	8112	92.6
2002	8418.9	1149.0	83.7	90.0	83.7	90.0	83.6	89.0	7328	83.7
2003	9736.6	1149.0	95.9	90.4	95.9	90.4	96.7	89.5	8401	95.9
2004	9168.7	1149.0	90.8	90.5	90.8	90.4	90.8	89.6	7970	90.7
2005	8592.9	1149.0	85.2	90.2	85.2	90.1	85.4	89.3	7464	85.2
2006	9276.1	1149.0	91.7	90.2	91.7	90.2	92.2	89.5	8024	91.6
2007	8347.3	1127.0	83.3	89.9	83.3	89.8	84.6	89.2	7323	83.6
2008	8727.1	1127.0	88.4	89.8	88.4	89.8	88.2	89.2	7767	88.4

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1989 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure					132	
B. Refuelling without a maintenance					28	
C. Inspection, maintenance or repair combined with refuelling	871			574		
D. Inspection, maintenance or repair without refuelling	144			61		
E. Testing of plant systems or component:				1		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					13	2
L. Human factor related					2	
Z. Others				3		
Subtotal	1015	0	0	639	175	2
Total	1015			816		

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

System	2008 Hours Lost	1989 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		12
13. Reactor Auxiliary System:		12
14. Safety Systems		15
15. Reactor Cooling System:		35
16. Steam generation system:		1
31. Turbine and auxiliaries		1
32. Feedwater and Main Steam System		26
35. All other I&C Systems		8
41. Main Generator System:		13
42. Electrical Power Supply System:		3
Total	0	126



# US-382 WATERFORD-3

Operator: ENTERGY (ENTERGY NUCLEAR)

Contractor: CE (COMBUSTION ENGINEERING CO.)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1157.0 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 2008

Net Energy Production: 9054.0 GW(e).h  
 Energy Availability Factor: 87.7%  
 Load Factor: 89.1%  
 Operating Factor: 87.7%  
 Energy Unavailability Factor: 12.3%  
 Total Off-line Time: 1081 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	883.3	827.6	882.5	736.9	0.0	784.6	876.6	870.8	568.8	882.5	856.6	883.7	9054.0
EAF (%)	100.0	100.0	100.0	86.7	0.0	97.9	100.0	99.8	69.3	100.0	100.0	100.0	87.7
UCF (%)	100.0	100.0	100.0	86.7	0.0	97.9	100.0	100.0	100.0	100.0	100.0	100.0	90.3
LF (%)	102.6	102.8	102.7	88.5	0.0	94.2	101.8	101.2	68.3	102.5	102.7	102.7	89.1
OF (%)	100.0	100.0	100.0	86.5	0.0	97.8	100.0	99.7	69.2	100.0	100.0	100.0	87.7
EUF (%)	0.0	0.0	0.0	13.3	100.0	2.1	0.0	0.2	30.7	0.0	0.0	0.0	12.3
PUF (%)	0.0	0.0	0.0	13.3	100.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	9.7
UCLF (%)	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
XUF (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	30.7	0.0	0.0	0.0	2.5

UCLF replaces previously used UUF.

## 4. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 14 Nov 1974      Lifetime Generation: 192881.3 GW(e).h  
 Date of First Criticality: 04 Mar 1985      Cumulative Energy Availability Factor: 86.7%  
 Date of Grid Connection: 18 Mar 1985      Cumulative Load Factor: 86.5%  
 Date of Commercial Operation: 24 Sep 1985      Cumulative Unit Capability Factor: 87.0%  
    Cumulative Energy Unavailability Factor: 13.3%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	1805.2	1099.0	76.1	76.1	76.1	76.1	68.8	68.8	1800	75.7
1986	7308.4	1096.0	79.5	78.7	79.5	78.7	76.1	74.5	6921	79.0
1987	7434.1	1075.0	80.9	79.7	80.9	79.7	78.9	76.4	7085	80.9
1988	6548.4	1075.0	73.7	77.9	73.7	77.9	69.3	74.3	6468	73.6
1989	7609.4	1075.0	81.5	78.7	81.5	78.7	80.8	75.8	7136	81.5
1990	8604.2	1075.0	92.2	81.3	92.2	81.3	91.4	78.7	8079	92.2
1991	7274.9	1075.0	78.9	80.9	78.5	80.8	77.3	78.5	6869	78.4
1992	7622.2	1075.0	82.1	81.1	82.1	81.0	80.7	78.8	7213	82.1
1993	9138.8	1075.0	99.2	83.3	99.2	83.2	97.0	81.0	8691	99.2
1994	7931.9	1075.0	86.3	83.6	86.3	83.5	84.2	81.3	7555	86.2
1995	7763.4	1075.0	82.7	83.5	82.7	83.4	82.4	81.5	7241	82.7
1996	8926.8	1075.0	93.8	84.4	93.8	84.4	94.5	82.6	8237	93.8
1997	6720.7	1075.0	70.4	83.3	70.4	83.2	71.4	81.7	6161	70.3
1998	8620.8	1075.0	91.0	83.8	91.0	83.8	91.5	82.4	7966	90.9
1999	7441.7	1075.0	78.9	83.5	78.9	83.5	79.0	82.2	6905	78.8
2000	8477.4	1075.0	88.2	83.8	88.2	83.8	89.8	82.7	7743	88.1
2001	9539.1	1075.0	99.5	84.8	99.5	84.7	101.3	83.8	8718	99.5
2002	8847.9	1075.0	92.8	85.2	92.8	85.2	94.0	84.4	8136	92.9
2003	8503.1	1075.0	89.7	85.5	89.7	85.4	90.3	84.7	7865	89.8
2004	9654.4	1075.0	99.9	86.2	99.9	86.2	102.2	85.7	8771	99.9
2005	7913.7	1089.0	84.0	86.1	79.7	85.9	82.9	85.5	6975	79.6
2006	9279.8	1158.0	91.3	86.4	91.3	86.1	91.5	85.8	7996	91.3
2007	9893.0	1157.0	96.2	86.8	96.2	86.6	97.6	86.4	8423	96.2
2008	9054.0	1157.0	90.3	87.0	87.7	86.7	89.1	86.5	7703	87.7

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1985 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		4			205	
B. Refuelling without a maintenance					13	
C. Inspection, maintenance or repair combined with refuelling	850			739		
D. Inspection, maintenance or repair without refuelling				108		
E. Testing of plant systems or component:				0		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					7	1
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)			222			15
Subtotal	850	4	222	847	225	16
Total	1076			1088		

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

System	2008 Hours Lost	1985 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		8
13. Reactor Auxiliary System:		4
14. Safety Systems		2
15. Reactor Cooling System:		90
17. Safety I&C Systems (excluding reactor I&C)		33
31. Turbine and auxiliaries	4	8
32. Feedwater and Main Steam System		24
33. Circulating Water System		2
35. All other I&C Systems		19
41. Main Generator System:		2
42. Electrical Power Supply System:		2
Total	4	194

# US-390 WATTS BAR-1

Operator: TVA (TENNESSEE VALLEY AUTHORITY)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 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 2008

Net Energy Production: 8112.3 GW(e).h  
 Energy Availability Factor: 82.5%  
 Load Factor: 82.2%  
 Operating Factor: 82.5%  
 Energy Unavailability Factor: 17.5%  
 Total Off-line Time: 1537 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	873.3	261.9	120.2	837.8	581.8	790.2	837.2	563.3	666.1	860.3	844.2	876.1	8112.3
EAF (%)	100.0	34.5	22.0	100.0	73.4	100.0	100.0	74.2	84.8	100.0	100.0	100.0	82.5
UCF (%)	100.0	34.5	22.0	100.0	73.4	100.0	100.0	74.2	84.9	100.0	100.0	100.0	82.5
LF (%)	104.5	33.5	14.4	103.6	69.6	97.7	100.2	67.4	82.4	103.0	104.3	104.9	82.2
OF (%)	100.0	34.3	21.9	100.0	73.4	100.0	100.0	74.2	84.7	100.0	100.0	100.0	82.5
EUF (%)	0.0	65.5	78.0	0.0	26.6	0.0	0.0	25.8	15.2	0.0	0.0	0.0	17.5
PUF (%)	0.0	65.5	78.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.8
UCLF (%)	0.0	0.0	0.0	0.0	26.6	0.0	0.0	25.8	15.2	0.0	0.0	0.0	5.7
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 23 Jan 1973      Lifetime Generation: 110957.1 GW(e).h  
 Date of First Criticality: 01 Jan 1996      Cumulative Energy Availability Factor: 89.5%  
 Date of Grid Connection: 06 Feb 1996      Cumulative Load Factor: 89.4%  
 Date of Commercial Operation: 05 May 1996      Cumulative Unit Capability Factor: 89.5%  
    Cumulative Energy Unavailability Factor: 10.5%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1996	5141.4	1109.0	87.7	87.7	87.7	87.7	89.0	89.0	4803	91.4
1997	7600.1	1117.0	82.3	84.3	82.3	84.3	77.7	81.9	7269	83.0
1998	9681.0	1117.0	99.0	90.0	99.0	90.0	98.9	88.5	8672	99.0
1999	8267.4	1118.0	86.8	89.1	86.8	89.1	84.4	87.3	7606	86.8
2000	9076.4	1118.0	92.5	89.8	92.5	89.8	92.4	88.4	8124	92.5
2001	9626.6	1125.0	96.1	91.0	96.1	91.0	97.5	90.1	8419	96.1
2002	9079.4	1125.0	91.3	91.0	91.3	91.0	92.1	90.4	7998	91.3
2003	8549.6	1121.0	86.2	90.4	86.2	90.4	86.9	89.9	7551	86.2
2004	9856.9	1121.0	98.8	91.4	98.8	91.4	100.1	91.1	8680	98.8
2005	8816.4	1121.0	89.5	91.2	89.5	91.2	89.8	91.0	7841	89.5
2006	6697.1	1121.0	69.7	89.1	69.7	89.1	68.2	88.8	6099	69.6
2007	10049.7	1123.0	100.0	90.1	100.0	90.1	102.2	90.0	8760	100.0
2008	8112.3	1123.0	82.5	89.5	82.5	89.5	82.2	89.4	7247	82.5

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1996 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		389			205	
B. Refuelling without a maintenance					7	
C. Inspection, maintenance or repair combined with refuelling	1035			551		
E. Testing of plant systems or component				54	3	
H. Nuclear regulatory requirement				88		
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					15	
L. Human factor related		109				
Subtotal	1035	498	0	693	230	0
Total		1533			923	

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

System	2008 Hours Lost	1996 to 2008 Average Hours Lost Per Year
12. Reactor I&C Systems		4
14. Safety Systems		14
15. Reactor Cooling System		17
31. Turbine and auxiliaries		65
32. Feedwater and Main Steam System	191	55
33. Circulating Water System		20
35. All other I&C Systems		3
41. Main Generator System	197	7
42. Electrical Power Supply System		16
Total	388	201

# US-482 WOLF CREEK

Operator: KGEKO (Kansas Gas and Electric Co.)

Contractor: WH (WESTINGHOUSE ELECTRIC CORPORATION AND SIEMENS)

## 1. Station Details

Type: PWR  
 Net Reference Unit Power  
 at the beginning of 2008: 1166.0 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 2008

Net Energy Production: 8505.9 GW(e).h  
 Energy Availability Factor: 82.8%  
 Load Factor: 83.0%  
 Operating Factor: 82.8%  
 Energy Unavailability Factor: 17.2%  
 Total Off-line Time: 1513 hours

## 3. 2008 Monthly Performance Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GW(e).h	718.8	827.8	463.8	0.0	437.7	846.7	870.9	865.4	847.5	883.3	858.1	885.9	8505.9
EAF (%)	83.9	100.0	53.3	0.0	56.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.8
UCF (%)	83.9	100.0	53.3	0.0	56.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.8
LF (%)	82.9	102.0	53.5	0.0	50.5	100.9	100.4	99.8	101.0	101.8	102.1	102.1	83.0
OF (%)	83.9	100.0	53.3	0.0	56.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.8
EUF (%)	16.1	0.0	46.7	100.0	43.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2
PUF (%)	0.0	0.0	37.7	100.0	43.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1
UCLF (%)	16.1	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
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. 2008 Summary of Operation

## 5. Historical Summary

Date of Construction Start: 31 May 1977  
 Date of First Criticality: 22 May 1985  
 Date of Grid Connection: 12 Jun 1985  
 Date of Commercial Operation: 03 Sep 1985

Lifetime Generation: 203237.5 GW(e).h  
 Cumulative Energy Availability Factor: 86.4%  
 Cumulative Load Factor: 85.8%  
 Cumulative Unit Capability Factor: 86.4%  
 Cumulative Energy Unavailability Factor: 13.6%

Year	Energy GW(e).h	Capacity MW(e)	Performance for Full Years of Commercial Operation							
			Unit Capability Factor (in %)		Energy Availability Factor (in %)		Load Factor (in %)		Annual Time Online	
			Annual	Cumul.	Annual	Cumul.	Annual	Cumul.	Hours	of (%)
1985	2942.1	1144.0	100.0	100.0	100.0	100.0	90.6	90.6	2770	96.2
1986	6966.1	1128.0	73.0	79.7	73.0	79.7	70.5	75.5	6416	73.2
1987	6504.1	1128.0	68.6	74.9	68.6	74.9	65.8	71.3	6009	68.6
1988	6676.4	1128.0	66.8	72.5	66.8	72.5	67.4	70.1	5963	67.9
1989	9709.3	1135.0	98.4	78.5	98.4	78.5	97.7	76.5	8618	98.4
1990	7889.1	1135.0	79.8	78.7	79.8	78.7	79.3	77.1	7036	80.3
1991	5891.4	1135.0	71.0	77.5	71.0	77.5	59.3	74.2	6288	71.8
1992	8490.7	1131.0	85.4	78.6	85.4	78.6	85.5	75.8	7538	85.8
1993	7908.6	1132.0	79.3	78.7	79.3	78.7	79.7	76.2	7000	79.9
1994	8546.0	1149.0	85.4	79.4	85.4	79.4	84.9	77.2	7500	85.6
1995	10062.2	1163.0	98.5	81.3	98.5	81.3	98.7	79.3	8625	98.5
1996	8233.7	1165.0	81.8	81.3	80.6	81.2	80.4	79.4	7078	80.6
1997	8447.5	1163.0	82.8	81.5	82.8	81.4	82.9	79.7	7255	82.8
1998	10400.7	1163.0	100.0	82.9	100.0	82.8	102.1	81.4	8760	100.0
1999	9156.6	1163.0	89.6	83.3	89.6	83.3	89.9	82.0	7847	89.6
2000	9071.4	1169.0	88.8	83.7	88.8	83.6	88.3	82.4	7795	88.7
2001	10346.7	1170.0	99.7	84.7	99.7	84.6	101.0	83.6	8731	99.7
2002	9041.7	1165.0	87.8	84.9	87.8	84.8	88.4	83.9	7695	87.8
2003	8902.5	1167.0	86.7	85.0	86.7	84.9	87.1	84.1	7594	86.7
2004	10132.7	1166.0	98.8	85.7	98.5	85.6	98.9	84.8	8650	98.5
2005	8820.9	1165.0	86.0	85.7	86.0	85.6	86.4	84.9	7528	85.9
2006	9350.3	1166.0	90.6	86.0	90.6	85.9	91.5	85.2	7935	90.6
2007	10369.1	1166.0	100.0	86.6	100.0	86.5	101.5	86.0	8760	100.0
2008	8505.9	1166.0	82.8	86.4	82.8	86.4	83.0	85.8	7271	82.8

## 6. Full Outages, Analysis by Cause

Outage Cause	2008 Hours Lost			1986 to 2008 Average Hours Lost Per Year		
	Planned	Unplanned	External	Planned	Unplanned	External
A. Plant equipment problem/failure		186			137	
B. Refuelling without a maintenance					119	
C. Inspection, maintenance or repair combined with refuelling	1325			839		
D. Inspection, maintenance or repair without refuelling				9	14	
E. Testing of plant systems or component:				0	1	
K. Load-following (frequency control reserve shutdown due to reduced energy demand)					9	4
N. Environmental conditions (lack of cooling water due to dry weather, cooling water temperature limits, flood, storm, lightning, etc.)						1
Subtotal	1325	186	0	848	280	5
Total		1511			1133	

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

System	2008 Hours Lost	1986 to 2008 Average Hours Lost Per Year
11. Reactor and Accessories		27
12. Reactor I&C Systems		12
15. Reactor Cooling System		1
16. Steam generation system		6
17. Safety I&C Systems (excluding reactor I&C)	119	1
31. Turbine and auxiliaries		5
32. Feedwater and Main Steam System	66	19
35. All other I&C Systems		5
41. Main Generator System		11
42. Electrical Power Supply System		4
Total	185	91

## 6. NON-ELECTRICAL APPLICATION OF NUCLEAR ENERGY IN MEMBER STATES

Table 6.1: District heating and process heat in 2008

Country	Reactor	District heating [Gcal]	Process heat [Gcal]	Total heat [Gcal]
Bulgaria	Kozloduy-5	56383	NA	56383
	Kozloduy-6	2924	NA	2924
Czech Republic	Temelin-1	3406	NA	3406
	Temelin-2	42115	NA	42115
Hungary	PAKS-2	4208	NA	4208
	PAKS-3	118380	NA	118380
	PAKS-4	114374	NA	114374
India	Rajasthan-1	NA	0	0
	Rajasthan-2	NA	0	0
	Rajasthan-3	NA	205370	205370
	Rajasthan-4	NA	398423	398423
Romania	Cernavoda-1	30053	NA	30053
	Cernavoda-2	1983	NA	1983
Russia	Balakovo-1	13300	0	13300
	Balakovo-2	0	0	0
	Balakovo-3	23969	0	23969
	Balakovo-4	7327	0	7327
	Beloyarsky-3	244404	0	244404
	Bilibino-1	24552	NA	24552
	Bilibino-2	58684	NA	58684
	Bilibino-3	51969	NA	51969
	Bilibino-4	53119	NA	53119
	Kalinin-1	173410	7133	180543
	Kalinin-2	170856	8532	179388
	Kalinin-3	N/A	0	0
	Kola-1	4930	2154	7084
	Kola-2	6261	2454	8715
	Kola-3	4724	1789	6513
	Kola-4	5380	2456	7836
	Kursk-1	65169	71793	136962
	Kursk-2	103634	119188	222822
	Kursk-3	105914	113049	218963
	Kursk-4	203001	187130	390131
	Leningrad-1	366542	0	366542
	Leningrad-2	240026	0	240026
	Leningrad-3	66506	0	66506
	Leningrad-4	237546	0	237546
	Novovoronezh-3	45713	14	45727
	Novovoronezh-4	91645	69	91714
	Novovoronezh-5	0	4479	4479
	Smolensk-1	219482	17628	237110
	Smolensk-2	189975	30477	220452
	Smolensk-3	147756	7682	155438
Slovakia	Bohunice-3	205765	15869	221634
	Bohunice-4	199078	9952	209030
Switzerland	Beznau-1	140	NA	140
	Beznau-2	7	NA	7
	Goesgen	NA	61720	61720
Ukraine	Khemlnitski-1	205617	NA	205617
	Khemlnitski-2	97133	NA	97133
	Rovno-1	18128	NA	18128
	Rovno-2	46724	NA	46724
	Rovno-3	194755	NA	194755
	Rovno-4	243972	NA	243972
	South Ukraine-1	82029	NA	82029
	South Ukraine-2	148156	NA	148156
	South Ukraine-3	118619	NA	118619
	Zaporozhe-1	54956	NA	54956
	Zaporozhe-2	57901	NA	57901
	Zaporozhe-3	48368	NA	48368
	Zaporozhe-4	69623	NA	69623
	Zaporozhe-5	111089	NA	111089
	Zaporozhe-6	120904	NA	120904

**Table 6.2: Water desalination in 2008**

Country	Reactor	Thermal energy [Gcal]	Electrical energy for reverse osmosis [MWh]	Water produced [m3]
India	Madras-1	0	0	0
	Madras-2	0	0	0
Japan	Genkai-3	18940	NA	268684
	Genkai-4	7919	NA	115868
	Ikata 1&2		NA	372750
	Ikata-3		NA	284000
	Ohi 1&2		NA	1052995
	Takahama 3&4		NA	506198
Pakistan	KANUPP	0	0	0



## **7. DESIGN CHARACTERISTICS**

Definitions for Nuclear Power Plant Characteristics can be found in  
IAEA-TECDOC-1544

AR-1

ATUCHA-1

ARGENTINA

## 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	: 22-NiMoCr-37
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: NONE
Reactor vessel overall length/height [m]	: 12.2
Inside shell diameter [m]	: 5.36
Shell thickness [mm]	: 220
Number of pressure channels	: -
Pressure channel material	: Stainless Steel
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	: ZIRLO
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 6000
Active core diameter [m]	: 4.54
Active core height/length [m]	: 5.3
Number of fissile fuel assemblies/bundles	: 253
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 38.8
Moderator weight [t]	: -
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	: Boron Carbide/Hafnium
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	: 3

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: D2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 11.5
Reactor outlet temperature [°C]	: 296
Reactor inlet temperature [°C]	: 262
Coolant mass flow at the rated power [t/h]	: 10000

### 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]	: -
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	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 2.8
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 4.26
HP cylinder Inlet steam moisture [%]	: -
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River
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>
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Number of heat 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]	: 4.34
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 U <sub>235</sub> ]	: -
Refuelling frequency [month]	: -
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	: Cadmium Alloy
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	: -
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]	: 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
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>
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Number of heat 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

ARMENIA-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 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	: 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 Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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]	: -

### 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	: 2/2
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]	: 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>
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Number of heat connection points per unit	: <Not Available>
Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -



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	: <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]	: 11
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
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	: -
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
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>
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Number of heat 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	: 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]	: 11
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
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
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>
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Number of heat 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]	: -
Refuelling frequency [month]	: 11
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	: 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	: 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	: -
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]	: 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>
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Number of heat 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]	: 11
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
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>
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Number of heat 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	: <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]	: 3.04
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]	: -
Fuel linear heat generation rate [kW/m]	: 22.15

#### Reactivity control

Control rod material	: Cadmium Alloy
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GDO2
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]	: 15.41
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	: <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]	: 39.7
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	: 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	: 2
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]	: 5.65
HP cylinder Inlet steam moisture [%]	: -
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]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Cooling towers
Number of condensers per turbine-generator	: 2
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)	: 1650
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
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Number of heat 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	: <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]	: 15
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]	: -
Fuel linear heat generation rate [kW/m]	: 17.85

#### Reactivity control

Control rod material	: Cadmium Alloy
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GDO2
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]	: 15.52
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	: <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]	: 39.6
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	: 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]	: -
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]	: 5.4
HP cylinder Inlet steam moisture [%]	: -
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]	: -
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>
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Number of heat 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	: <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]	: 3.04
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]	: -
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]	: -
Fuel linear heat generation rate [kW/m]	: 16.47

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GDO2
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]	: 15.52
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	: <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]	: 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	: 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]	: -
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]	: 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]	: -
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>
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Number of heat 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	: <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 [%]	: 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	: 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	: 21

### 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]	: 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	: 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	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -

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	: -
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]	: 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
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>
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Number of heat 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]	: -
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]	: -
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	: <Not Available>
Burnable neutron absorber material	: Gadolinium/Boron
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]	: 15.9
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	: -
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]	: 65
Number of safety valves	: 2
Number of relief valves	: 1
Installed heater power [kW]	: -

### Containment systems

Containment type	: Double
Containment Shape	: Spherical
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]	: 5.3
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	: 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	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
HP cylinder inlet steam pressure [MPa]	: 6.295
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 284.5
HP cylinder Inlet steam flow rate [t/h]	: 7200

### Main generator

Rated active power [MWe]	: 1309
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: -
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea
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)	: 2
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	: 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	: -
Cable segregation within the unit used for	: -
On-site fire 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)	: <Not Available>
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)	: 1084
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
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Number of heat connection points per unit	: <Not Available>
Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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]	: -
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	: -

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]	: 5980

### Main generator

Rated active power [MWe]	: 1000
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River
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	: 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	: 2/3
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>
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Number of heat 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>
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]	: -
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	: 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	: 2/3
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>
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Number of heat connection points per unit	: <Not Available>
Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

CA-10

BRUCE-3

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
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
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>
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Number of heat 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]	: 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
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>
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Number of heat 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
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
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>
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Number of heat 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
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
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>
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Number of heat 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
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
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>
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Number of heat 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 U <sub>235</sub> ]	: -
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
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
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>
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Number of heat 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
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
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
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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
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
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
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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
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
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
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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
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
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
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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, Hemispherical 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]	: 6.36
Inside shell diameter [m]	: 0.103
Shell thickness [mm]	: 13.175
Number of pressure channels	: 380
Pressure channel material	: Zircaloy
Pressure channel wall thickness [mm]	: 4.343

#### 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]	: 7000
Active core diameter [m]	: 7.69
Active core height/length [m]	: 6.06
Number of fissile fuel assemblies/bundles	: 4560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 65
Moderator weight [t]	: 255.67
Number of fuel elements per assembly/bundle	: 37
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 12.9
Average fuel power density [kW/kgU]	: 80
Fuel linear heat generation rate [kW/m]	: 45.4

#### Reactivity control

Control rod material	: Cadmium Alloy
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]	: 207.5
Operating coolant pressure [MPa]	: 10.2
Reactor outlet temperature [°C]	: 310
Reactor inlet temperature [°C]	: 266
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	: 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]	: 3177

### Main coolant pumps/circulators

Total number of pumps/circulators	: 4
Number of pumps per RCS loop	: 2
Pump motor rating [MW]	: 5
Design pressure difference [MPa]	: 1.7

### Pressurizer

Total volume [m3]	: 45
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	: Reinforced Concrete
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: Spray

Total containment volume [m3]	: 48477
Number of containment spray pumps	: 1
Containment design pressure [MPa]	: 1.27
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	: 1
Number of hydroaccumulators	: <Not Applicable>
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 4.5
LPSI system pressure [MPa]	: 1.2
HPSI system flowrate [t/h]	: <Not Available>
LPSI system flowrate [t/h]	: <Not Available>

### 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]	: 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]	: 4.64
HP cylinder Inlet steam moisture [%]	: 0.2
HP cylinder inlet steam temperature [°C]	: 258
HP cylinder Inlet steam flow rate [t/h]	: 4000

### Main generator

Rated active power [MWe]	: 685
Rated apparent power [MVA]	: 805.88
Output voltage [kV]	: 24
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: River
Number of condensers per turbine-generator	: 2
Condenser tube material	: Copper

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]	: 3

**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	: 3
Feedwater discharge pressure [MPa]	: 5.481
Steam generator feedwater inlet temperature [°C]	: 186.9

**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)	: 4
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)	: 6
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	: 6
Estimated time reserve of the batteries at full load [h]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 11.9
Total battery capacity [Ah]	: 1800

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 45000
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: 12000

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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	: 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 U <sub>235</sub> ]	: -
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
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
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>
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Number of heat 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
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	: <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>
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Number of heat 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
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
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>
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Number of heat 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
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
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>
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Number of heat 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
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
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>
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Number of heat 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
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
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>
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Number of heat 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 U <sub>235</sub> ]	: -
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
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
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>
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Number of heat 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

GUANGDONG-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]	: 12
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	: <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>
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Number of heat 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]	: 12
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
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	: <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>
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Number of heat 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>
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	: <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>
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Number of heat 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>
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	: <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>
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Number of heat 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-508-111
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
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 [m3]	: 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
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>
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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]	: -
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
Burnable neutron absorber material	: Boron
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	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
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 [m <sup>2</sup> ]	: 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 [m <sup>3</sup> ]	: 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]	: .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
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>
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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
Burnable neutron absorber material	: Boron
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	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
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 [m <sup>2</sup> ]	: 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 [m <sup>3</sup> ]	: 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
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>
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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, 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 U <sup>235</sup> ]	: 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
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	: <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)	: 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>
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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
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
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>
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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, 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	: <Not Available>
Refuelling type	: OFF-line
Moderator material	: H2O
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]	: 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>
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]	: 0.7
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	: 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	: -



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	: 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	: 2/3
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>
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Number of heat 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	: -
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]	: 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>
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]	: 0.7
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	: 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]	: -
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: -
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	: 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	: 2/3
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>
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Number of heat 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	: 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]	: 1.5
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	: 2/2
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]	: 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>
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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
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]	: 1.5
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	: 2/2
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]	: 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>
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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
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]	: 1.5
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	: 2/2
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]	: 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>
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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
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]	: 1.5
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	: 2/2
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]	: 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>
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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
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 [m3]	: 60000
Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 4.6
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	: 2/3
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>
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Number of heat 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
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 [m3]	: 60000
Number of containment spray pumps	: 3
Containment design pressure [MPa]	: 4.6
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	: 2/3
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>
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Number of heat 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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FINLAND

## Design Characteristics

### Primary 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]	: 3.7
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 2.88
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]	: 38
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> ]	: 97
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 14.4

#### 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	:
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]	: 268
Coolant mass flow at the rated power [t/h]	: 31000

### 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]	: 1.1
Design pressure difference [MPa]	: 0.43

### Pressurizer

Total volume [m3]	: 37.8
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	:
Containment design pressure [MPa]	: 0.75
Design leakage rate [% per day]	: 0.2
Type of H2 recombiner	:

### 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	:
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]	: 372

### Main generator

Rated active power [MWe]	: 260
Rated apparent power [MVA]	: 235
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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]	: 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]	: 6.6
Steam generator feedwater inlet temperature [°C]	: 228

**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)	: 485
Interim storage facility type	: Other - N/A
Interim storage facility capacity (number of spent fuel assemblies)	:

**Non-electrical applications**

Primary heat connection	: <Not Available>
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Number of heat 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	: 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
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33.3
Average discharge burnup [MWd/t]	: 40000
Active core diameter [m]	: 2.88
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]	: 38
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> ]	: 97
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 14.4

#### 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	:
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]	: 268
Coolant mass flow at the rated power [t/h]	: 31000

### 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]	: 1.1
Design pressure difference [MPa]	: 0.43

### Pressurizer

Total volume [m3]	: 37.8
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	:
Containment design pressure [MPa]	: 0.75
Design leakage rate [% per day]	: 0.2
Type of H2 recombiner	:

### 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]	: 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	:
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]	: 372

### Main generator

Rated active power [MWe]	: 260
Rated apparent power [MVA]	: 235
Output voltage [kV]	: 15.75
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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]	: 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]	: 6.6
Steam generator feedwater inlet temperature [°C]	: 228

#### 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)	: 485
Interim storage facility type	: Wet
Interim storage facility capacity (number of spent fuel assemblies)	: 4618

#### Non-electrical applications

Primary heat connection	: <Not Available>
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Number of heat 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	: 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]	: 3.63
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 37000
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]	: 86.9
Moderator weight [t]	: <Not Applicable>
Number of fuel elements per assembly/bundle	: 81
Fuel clad thickness [mm]	: 0.8
Average core power density [kW/dm <sup>3</sup> ]	: 57.5
Average fuel power density [kW/kgU]	: 28.6
Fuel linear heat generation rate [kW/m]	: 14.9

#### 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	: H3BO3 Injection
Number of control rod assemblies	: 121

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H2O
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 [m2]	: <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 [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
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 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]	: 855
Rated apparent power [MVA]	: 950
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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)	: 3573

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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]	: 3.47
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 37000
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]	: 89
Moderator weight [t]	: <Not Applicable>
Number of fuel elements per assembly/bundle	: 64
Fuel clad thickness [mm]	: 0.8
Average core power density [kW/dm <sup>3</sup> ]	: 57.5
Average fuel power density [kW/kgU]	: 29.5
Fuel linear heat generation rate [kW/m]	: 13.1

#### 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	: H3BO3 Injection
Number of control rod assemblies	: 121

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H2O
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 [m2]	: <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 [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
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 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]	: 814.5
Rated apparent power [MVA]	: 905
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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)	: 3573

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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>
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 [%]	: 33.3
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>
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Number of heat 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]	: 12
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
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	: <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>
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Number of heat 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
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
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>
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Number of heat 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]	: 3.44
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
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	: <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>
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Number of heat 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]	: 3.44
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
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	: <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>
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Number of heat 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]	: 3.44
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
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	: <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>
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Number of heat 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
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
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>
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Number of heat 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
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>
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Number of heat 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> ]	: 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
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>
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Number of heat 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	: 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>
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Number of heat 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]	: 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> ]	: 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
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>
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Number of heat 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]	: 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> ]	: 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
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	: <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>
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Number of heat 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]	: 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> ]	: 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
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	: <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>
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Number of heat 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]	: 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> ]	: 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
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	: <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>
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Number of heat 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
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>
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Number of heat 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
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	: <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>
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Number of heat 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
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	: <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>
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Number of heat 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	: <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>
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Number of heat 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	: UO <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 [%]	: 33.3
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/dm <sup>3</sup> ]	: 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
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>
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Number of heat 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	: 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
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>
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Number of heat 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]	: 12
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
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>
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Number of heat 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]	: 12
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
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>
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Number of heat 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 U <sub>235</sub> ]	: -
Refuelling frequency [month]	: 2
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]	: 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>
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Number of heat 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]	: 2
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]	: 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	: <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>
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Number of heat 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]	: 2
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]	: 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	: <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>
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Number of heat 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]	: 2
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]	: 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	: <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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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]	: 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
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
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>
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Number of heat 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]	: 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
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
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>
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Number of heat 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]	: 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
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
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>
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Number of heat 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]	: 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
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	: <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>
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Number of heat 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]	: 12
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
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>
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Number of heat 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]	: 12
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
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	: <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>
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Number of heat 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
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
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>
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Number of heat 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
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
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>
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Number of heat 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
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	: <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>
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Number of heat 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
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	: <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>
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Number of heat 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
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	: <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>
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Number of heat 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
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	: <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>
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Number of heat 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]	: 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]	: 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]	: 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
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>
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Number of heat 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]	: 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]	: 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]	: 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
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	: <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>
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Number of heat 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]	: 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	: Boron Carbide/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	: 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
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>
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Number of heat 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]	: 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	: Boron Carbide/Cadmium 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	: -
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]	: 15.5
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 [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	: 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	: <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>
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Number of heat 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]	: 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	: Boron Carbide/Cadmium 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	: -
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]	: 15.5
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 [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	: 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	: <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>
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Number of heat 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]	: 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	: Boron Carbide/Cadmium 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	: -
Number of control rod assemblies	: 36

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
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 [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	: 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	: <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>
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Number of heat 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]	: 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> ]	: 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
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
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>
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Number of heat 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]	: 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	: 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
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	: <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>
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Number of heat 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	: Stainless Steel
Reactor vessel material specification	: SS316
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 12
Inside shell diameter [m]	: 12
Shell thickness [mm]	: 15
Number of pressure channels	: -
Pressure channel material	: -
Pressure channel wall thickness [mm]	: -

#### Reactor Core

Fuel assembly geometry	: Hexagonal
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /PuO <sub>2</sub>
Refuelling type	: OFF-line
Moderator material	: <Not Applicable>
Fuel clad material	: Stainless Steel
Fuel clad material specification	: SS 1515TI
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 5
Part of the core refuelled [%]	: 15
Average discharge burnup [MWd/t]	: 100000
Active core diameter [m]	: 1.39
Active core height/length [m]	: 0.85
Number of fissile fuel assemblies/bundles	: 103
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: -
Fuel weight [t]	: 101
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 217
Fuel clad thickness [mm]	: 0.45
Average core power density [kW/dm <sup>3</sup> ]	: 406
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: -

#### Reactivity control

Control rod material	: Boron Carbide
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	: Na
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 1
Reactor outlet temperature [°C]	: 530
Reactor inlet temperature [°C]	: 380
Coolant mass flow at the rated power [t/h]	: 3600

### Steam generators (SG)/drum separators

Type of SG	: Modular
SG output	: Superheated Steam
Number of SG	: 2
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	: 3
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]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: Rectangular
Containment structure	: <Not Available>
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: <Not Available>

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.04
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### 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	: 2
HP cylinder inlet steam pressure [MPa]	: 16.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 520
HP cylinder Inlet steam flow rate [t/h]	: 790

### Main generator

Rated active power [MWe]	: 250
Rated apparent power [MVA]	: <Not Available>
Output voltage [kV]	: 20
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River
Number of condensers per turbine-generator	: 1
Condenser tube material	: Brass

Number of main condensate pumps	: -
Number of main 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>
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Number of heat 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]	: 28
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
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>
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Number of heat 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]	: 28
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
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	: <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>
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Number of heat 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
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>
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Number of heat 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
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	: <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>
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Number of heat 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
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
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>
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Number of heat 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
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	: <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>
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Number of heat 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
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	: <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>
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Number of heat 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
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	: <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>
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Number of heat 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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BIBLIS-A (KWB A)

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	: 5-CR-NI-NB-199 (1.4551)
Reactor vessel overall length/height [m]	: 13.25
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 235
Number of 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 [%]	: 35
Average discharge burnup [MWd/t]	: 36000
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]	: 0.78
Average core power density [kW/dm <sup>3</sup> ]	: 86.96
Average fuel power density [kW/kgU]	: 34.3
Fuel linear heat generation rate [kW/m]	: 19.4

#### Reactivity control

Control rod material	: Cadmium Alloy
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	: 4
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.4
Reactor outlet temperature [°C]	: 313
Reactor inlet temperature [°C]	: 283.4
Coolant mass flow at the rated power [t/h]	: 78363

### 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	: 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	: 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]	: 5.3
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]	: 5.2
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 267.6
HP cylinder Inlet steam flow rate [t/h]	: 6680

### Main generator

Rated active power [MWe]	: 1225
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>
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Number of heat 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	: Alloyed Steel
Vessel cladding material specification	: 5-CR-NI-NB-199 (1.4551)
Reactor vessel overall length/height [m]	: 13.25
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 243
Number of 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 [%]	: 35
Average discharge burnup [MWd/t]	: 33000
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]	: 0.78
Average core power density [kW/dm <sup>3</sup> ]	: 92.3
Average fuel power density [kW/kgU]	: 36.7
Fuel linear heat generation rate [kW/m]	: 20.6

#### 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	: 61

### 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]	: 319.1
Reactor inlet temperature [°C]	: 288.5
Coolant mass flow at the rated power [t/h]	: 78400

### 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	: 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	: 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]	: 5.7
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 5.4
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 270
HP cylinder Inlet steam flow rate [t/h]	: 7160

### Main generator

Rated active power [MWe]	: 1300
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>
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Number of heat 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 (KBR)

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]	: 12.82
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 243
Number of 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]	: -
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]	: 102.7
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	: -
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]	: 326.1
Reactor inlet temperature [°C]	: 291.3
Coolant mass flow at the rated power [t/h]	: 15660

### 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	: 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]	: 6.5
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]	: -
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]	: 1363
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>
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Number of heat 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-D-2 (22 NiMoCo 37)
Vessel cladding material	: Alloyed Steel
Vessel cladding material specification	: X10-CR-NI-NB-18.9
Reactor vessel overall length/height [m]	: 20.7
Inside shell diameter [m]	: 5.58
Shell thickness [mm]	: 136
Number of pressure channels	: <Not Applicable>
Pressure channel material	: -
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 [%]	: -
Average discharge burnup [MWd/t]	: 32000
Active core diameter [m]	: 3.696
Active core height/length [m]	: 3.76
Number of fissile fuel assemblies/bundles	: 532
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 96
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.82
Average core power density [kW/dm <sup>3</sup> ]	: 50.6
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 17.9

#### 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	: 129

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 286
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	: 8
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	: Confinement
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]	: 4.6
Design leakage rate [% per day]	: 1
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.8
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 1140

### Main generator

Rated active power [MWe]	: 860
Rated apparent power [MVA]	: 1006
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River
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>
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Number of heat 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	: 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]	: 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	: <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]	: 37000
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> ]	: 95.1
Average fuel power density [kW/kgU]	: 36.6
Fuel linear heat generation rate [kW/m]	: 16.67

#### Reactivity control

Control rod material	: Cadmium Alloy
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]	: 325.6
Reactor inlet temperature [°C]	: 291.5
Coolant mass flow at the rated power [t/h]	: 71035

### 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	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 6.3
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]	: 6.17
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]	: 1333
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>
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Number of heat 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]	: 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	: <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]	: 11
Part of the core refuelled [%]	: 28
Average discharge burnup [MWd/t]	: 45000
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> ]	: 93.2
Average fuel power density [kW/kgU]	: 36.53
Fuel linear heat generation rate [kW/m]	: 20.7

#### Reactivity control

Control rod material	: Cadmium Alloy
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]	: 327
Reactor inlet temperature [°C]	: 292
Coolant mass flow at the rated power [t/h]	: 16750

### 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	: 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	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5.4
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]	: 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]	: 6.77
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 7400

### Main generator

Rated active power [MWe]	: 1345
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>
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Number of heat 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]	: 5.5
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	: <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/DUPLEX
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 75
Average discharge burnup [MWd/t]	: 40000
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> ]	: 95.3
Average fuel power density [kW/kgU]	: 36.366
Fuel linear heat generation rate [kW/m]	: 21.1

#### Reactivity control



Control rod material	: Cadmium Alloy
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]	: 15.66
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	: <Not Available>
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]	: -
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]	: 5.3
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]	: 6.72
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 284.5
HP cylinder Inlet steam flow rate [t/h]	: 7488

### Main generator

Rated active power [MWe]	: 1430
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>
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Number of heat 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]	: 163
Number of 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]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 18
Average discharge burnup [MWd/t]	: 45000
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	: 91
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]	: 14.6

#### Reactivity control

Control rod material	: Boron Carbide
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]	: 275
Coolant mass flow at the rated power [t/h]	: 51480

### 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	: 8
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	: 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]	: 3.55
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.7
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]	: 1344
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>
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Number of heat 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]	: 163
Number of 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]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 45000
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	: 92
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
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 Available>
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 275
Coolant mass flow at the rated power [t/h]	: 51480

### 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	: 8
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	: 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]	: 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]	: 6.7
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]	: 1344
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>
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Number of heat 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-CL-1, 22-NI-MO-CR-37 (1.6751)
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 20.7
Inside shell diameter [m]	: 5.85
Shell thickness [mm]	: 148
Number of 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]	: 11
Part of the core refuelled [%]	: 27
Average discharge burnup [MWd/t]	: 45000
Active core diameter [m]	: 4.19
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 592
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	: 62
Fuel clad thickness [mm]	: 0.63
Average core power density [kW/dm <sup>3</sup> ]	: 50.4
Average fuel power density [kW/kgU]	: 22.5
Fuel linear heat generation rate [kW/m]	: 17.6

#### Reactivity control

Control rod material	: Boron Carbide
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	: <Not Available>
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 215
Coolant mass flow at the rated power [t/h]	: 5010

### 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	: 8
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	: Confinement
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]	: 4.4
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]	: 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]	: 6.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 4650

### Main generator

Rated active power [MWe]	: 907
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>
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Number of heat 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]	: 12.4
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	: <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 [%]	: 20
Average discharge burnup [MWd/t]	: 60000
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]	: 0.64
Average core power density [kW/dm <sup>3</sup> ]	: 93.2
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 17.1

#### Reactivity control

Control rod material	: Cadmium Alloy
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]	: 327.8
Reactor inlet temperature [°C]	: 293.5
Coolant mass flow at the rated power [t/h]	: 67680

### 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	: 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]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: 72000
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5.3
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]	: -
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]	: 6.35
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]	: 1520
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	: <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)	: 184
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
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Number of heat 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-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.85
Inside shell diameter [m]	: 6.7
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	: <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 [%]	: -
Average discharge burnup [MWd/t]	: 32000
Active core diameter [m]	: 4.99
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 840
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 152.4
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.82
Average core power density [kW/dm <sup>3</sup> ]	: 50.9
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 18.3

#### 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	: 205

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 215
Coolant mass flow at the rated power [t/h]	: 55600

### 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	: 10
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	: Confinement
Containment Shape	: <Not Available>
Containment structure	: Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: 11260
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5.1
Design leakage rate [% per day]	: 1
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.81
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 283
HP cylinder Inlet steam flow rate [t/h]	: 1849

### Main generator

Rated active power [MWe]	: 1316
Rated apparent power [MVA]	: 1530
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River
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>
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Number of heat 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	: <Not Available>
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 10.9
Inside shell diameter [m]	: 4.36
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]	: 36700
Active core diameter [m]	: 3.24
Active core height/length [m]	: 2.985
Number of fissile fuel assemblies/bundles	: 177
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 63
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 205
Fuel clad thickness [mm]	: 0.72
Average core power density [kW/dm <sup>3</sup> ]	: 102
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 22.6

#### Reactivity control

Control rod material	: Cadmium Alloy
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	: 45

### 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]	: 320.2
Reactor inlet temperature [°C]	: 291.8
Coolant mass flow at the rated power [t/h]	: 14245

### Steam generators (SG)/drum separators

Type of SG	: Vertical
SG output	: <Not Available>
Number of SG	: 3
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]	: -
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]	: 45
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]	: 4.7
Design leakage rate [% per day]	: 1
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 5
Number of LPSI systems	: 5
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	: 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]	: 5.9
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 274
HP cylinder Inlet steam flow rate [t/h]	: 1116.215

### Main generator

Rated active power [MWe]	: 688
Rated apparent power [MVA]	: 850
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)	: 118
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
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Number of heat 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]	: 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	: <Not Available>
Fuel material	: UO <sub>2</sub> /PuO <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 [%]	: 23
Average discharge burnup [MWd/t]	: 36800
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
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]	: 291.7
Coolant mass flow at the rated power [t/h]	: 17672

### 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	: U-tube
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	: 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]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: 72000
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5.3
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]	: -
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]	: 6.35
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]	: 1395
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	: -

Number of main condensate pumps	: -
Number of main 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)	: 184
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
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Number of heat 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-CL-1; 22-NI-MO-CR-37 (1.6751)
Vessel cladding material	: <Not Available>
Vessel cladding material specification	: 5-CR-NI-NB-199 (1.4551)
Reactor vessel overall length/height [m]	: 21.276
Inside shell diameter [m]	: 5.85
Shell thickness [mm]	: 143
Number of 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 [%]	: 20.5
Average discharge burnup [MWd/t]	: 39900
Active core diameter [m]	: 4.5
Active core height/length [m]	: 3.66
Number of fissile fuel assemblies/bundles	: 592
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	: 72
Fuel clad thickness [mm]	: 0.67
Average core power density [kW/dm <sup>3</sup> ]	: 51.1
Average fuel power density [kW/kgU]	: 22.3
Fuel linear heat generation rate [kW/m]	: 15.8

#### Reactivity control



Control rod material	: Boron Carbide
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	: -
Number of control rod assemblies	: 145

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.1
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 215
Coolant mass flow at the rated power [t/h]	: 37300

### 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	: 9
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	: Confinement
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]	: 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]	: 6.35
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 5010

### Main generator

Rated active power [MWe]	: 926
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>
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Number of heat 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	: <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 [%]	: 20
Average discharge burnup [MWd/t]	: 40000
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]	: -
Fuel linear heat generation rate [kW/m]	: 29.7

#### 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	: 61

### 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]	: 325.8
Reactor inlet temperature [°C]	: 291.4
Coolant mass flow at the rated power [t/h]	: 67680

### 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	: 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]	: -

### Containment systems

Containment type	: Single
Containment Shape	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: 72000
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5.3
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]	: -
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]	: 6.25
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]	: 1424
Rated apparent power [MVA]	: 1560
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River
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)	: 185
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
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Number of heat 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	: AS
Reactor vessel overall length/height [m]	: 10
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 243
Number of 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> /PuO <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]	: 11
Part of the core refuelled [%]	: 30
Average discharge burnup [MWd/t]	: 35400
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]	: 103.6
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> ]	: 92.4
Average fuel power density [kW/kgU]	: 36.7
Fuel linear heat generation rate [kW/m]	: 20.5

#### 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	: 61

### 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]	: 321.9
Reactor inlet temperature [°C]	: 289.3
Coolant mass flow at the rated power [t/h]	: 72000

### 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	: 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
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.7
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 5.52
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 279
HP cylinder Inlet steam flow rate [t/h]	: 6803

### Main generator

Rated active power [MWe]	: <Not Available>
Rated apparent power [MVA]	: 1530
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>
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Number of heat 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	: 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]	: 11
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]	: 2.5
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/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]	: 4.2
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
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
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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]	: 11
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]	:
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]	: 2.5
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	:

## 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
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
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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]	: 11
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]	: 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]	: 2.5
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	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
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 [%]	: 0.25
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
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
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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]	: 11
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	:
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]	: 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]	: 2.5
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	: <Not Available>

### Engineered Safeguard Feature Actuation System

Control equipment technology	: Digital
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]	: 1340

### Main generator

Rated active power [MWe]	: 230
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River
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	: 2/2
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]	: 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)	: 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
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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>
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Number of heat 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
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>
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Number of heat 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>
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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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> ]	: 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
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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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]	: -
Refuelling frequency [month]	: 18
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 21000
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
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	: -

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
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>
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Number of heat 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	: <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]	: 21000
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
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	: -

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	: -
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]	: 6.88
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	: <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>
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Number of heat 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
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	: <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>
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Number of heat 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
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	: <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>
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Number of heat 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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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	: ASTM-A-533-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 19.7
Inside shell diameter [m]	: 4.8
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]	: 13
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 39500
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]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 40.6
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 19

#### 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	: 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]	: 285
Reactor inlet temperature [°C]	: 183
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 [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	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 3410
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.35
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)	: 4
HPSI systems pressure [MPa]	: 1.9
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]	: 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]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 683

### Main generator

Rated active power [MWe]	: 460
Rated apparent power [MVA]	: 525
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 900
Interim storage facility type	: Other - Wet,Dry
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
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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	: ASTM-A-533-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.9
Inside shell diameter [m]	: 5.5
Shell thickness [mm]	: 138
Number of 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]	: 13
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 39500
Active core diameter [m]	: 4.03
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 548
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 94
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50.4
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 19

#### 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 H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
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]	: -
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 183
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]	: -
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]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 4240
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.92
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]	: 2.7
LPSI system pressure [MPa]	: 1.3
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	: -
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]	: 1230

### Main generator

Rated active power [MWe]	: 784
Rated apparent power [MVA]	: 911
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1240
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
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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	: ASTM-A-533-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 21.9
Inside shell diameter [m]	: 5.57
Shell thickness [mm]	: 138
Number of 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]	: 13
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 39500
Active core diameter [m]	: 4.03
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 548
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 94
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50.4
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 19

#### 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 H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
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]	: -
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 183
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]	: -
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]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 4240
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.92
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]	: 2.7
LPSI system pressure [MPa]	: 1.3
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	: -
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]	: 1230

### Main generator

Rated active power [MWe]	: 784
Rated apparent power [MVA]	: 911
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1220
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
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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	: ASTM-A-533-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS AND HIGH-NI-STEEL
Reactor vessel overall length/height [m]	: 21.9
Inside shell diameter [m]	: 5.5
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	: Magnesium Alloy
Fuel clad material specification	: ZR-2
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 39500
Active core diameter [m]	: 4.03
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 548
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 94
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50.4
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 19

#### 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 H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
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]	: -
Operating coolant pressure [MPa]	: 7.07
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 183
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]	: -
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]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>



Total containment volume [m3]	: 4240
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.92
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]	: 2.7
LPSI system pressure [MPa]	: 1.3
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	: -
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]	: 1230

### Main generator

Rated active power [MWe]	: 784
Rated apparent power [MVA]	: 911
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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	: -
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1590
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
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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	: ASTA-A-533-B-CL-5
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS AND HIGH-NI-STEEL
Reactor vessel overall length/height [m]	: 21.9
Inside shell diameter [m]	: 5.5
Shell thickness [mm]	: 138
Number of 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]	: 13
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 39500
Active core diameter [m]	: 4.03
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 548
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 94
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50.4
Average fuel power density [kW/kgU]	: -
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	: GD203
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]	: 285
Reactor inlet temperature [°C]	: 183
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 [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	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 4240
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.92
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]	: 2.7
LPSI system pressure [MPa]	: 1.4
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	: -
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]	: 1230

### Main generator

Rated active power [MWe]	: 784
Rated apparent power [MVA]	: 911
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site 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)	: 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)	: 1590
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
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Number of heat 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	: JISG-3120/SQV-2-A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 23
Inside shell diameter [m]	: 6.41
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]	: -
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: -
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]	: 132
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: 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]	: 7.07
Reactor outlet temperature [°C]	: 285
Reactor inlet temperature [°C]	: 183
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 [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	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 5700
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 2.85
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]	: -
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	: -
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]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site 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)	: 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]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1770
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
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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]	: 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]	: -
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: -
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]	: 132
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.07
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 [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]	: -
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]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 5700
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 2.85
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]	: -
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]	: 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]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
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]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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]	: -

#### 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>
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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]	: -
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: -
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]	: 132
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.07
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 [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]	: -
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]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 8700
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 2.85
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]	: -
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]	: 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]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
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]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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]	: -

#### 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>
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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]	: -
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: -
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]	: 132
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.07
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 [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]	: -
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]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 8700
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
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]	: -
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]	: 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]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
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]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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]	: -

#### 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>
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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]	: -
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: -
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]	: 132
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: 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]	: 7.07
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]	: -
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	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 8700
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
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)	: <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	: 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	: -
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]	: 1780

### Main generator

Rated active power [MWe]	: 1100
Rated apparent power [MVA]	: 1300
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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]	: -

#### 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>
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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]	: 2.5
Active core height/length [m]	: 3.7
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]	: 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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
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]	: 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	: -
Design thermal capacity per SG [MW]	: 825
Design heat transfer surface [m <sup>2</sup> ]	: 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 [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	: 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 [%]	: 0.25
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
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)	: 328
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: Turbine Extraction
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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]	: 48
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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
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 [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]	: 4.48
Design pressure difference [MPa]	: 0.7

### 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+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
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
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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>
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]	: 12
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
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]	: 4.5
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
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
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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]	: 12
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
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]	: 4.5
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]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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
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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	: SA-533GrB CL1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: ASME SA-371 ER309L improved type
Reactor vessel overall length/height [m]	: 20.972
Inside shell diameter [m]	: 4.68
Shell thickness [mm]	: 114
Number of 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]	: 2.2
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 27500
Active core diameter [m]	: 3.3
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]	: 69
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 63
Fuel clad thickness [mm]	: 0.9
Average core power density [kW/dm <sup>3</sup> ]	: 51
Average fuel power density [kW/kgU]	: 23.1
Fuel linear heat generation rate [kW/m]	: 18.0

#### Reactivity control

Control rod material	: Boron Carbide
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	: 89

### 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]	: 188.8
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]	: 2.54
Design pressure difference [MPa]	: 1.65

### 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	: Double
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 3740
Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 3.92
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]	: 1.35
LPSI system pressure [MPa]	: 1.17
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	: 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]	: 282.3
HP cylinder Inlet steam flow rate [t/h]	: 2906.97

### Main generator

Rated active power [MWe]	: 540
Rated apparent power [MVA]	: 626
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea
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]	: 5.1

**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]	: 7.5
Steam generator feedwater inlet temperature [°C]	: -

**Auxiliary / Emergency feedwater**

Number of electrical motor-driven pumps	: <Not Available>
Number of diesel driven pumps	: <Not Applicable>
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 + 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)	: 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	: <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]	: 7
Total battery capacity [Ah]	: -

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 740
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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-B/SA-508-CL (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]	: 21.855
Inside shell diameter [m]	: 5.57
Shell thickness [mm]	: 138
Number of 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]	: 2.74
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 27500
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]	: 105
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 63
Fuel clad thickness [mm]	: 0.86
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]	: 18.0

#### Reactivity control

Control rod material	: Boron Carbide
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	: 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]	: 215.6
Coolant mass flow at the rated power [t/h]	: 34900

### 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]	: 4.26
Design pressure difference [MPa]	: 1.61

### 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	: Double
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 4320
Number of containment spray pumps	: 4
Containment design pressure [MPa]	: 3.92
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]	: 1.30
LPSI system pressure [MPa]	: 1.32
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	: 2
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]	: 282.3
HP cylinder Inlet steam flow rate [t/h]	: 4738

### Main generator

Rated active power [MWe]	: 840
Rated apparent power [MVA]	: 940
Output voltage [kV]	: 18
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea
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]	: 5.1

**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]	: 6.57
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	: 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)	: 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	: <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]	: 11
Total battery capacity [Ah]	: -

**Spent fuel storage**

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 1220
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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 (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
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 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]	: 5.95
Design pressure difference [MPa]	: 2.36

### 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	: 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]	: 4.35
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]	: -
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	: 2
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]	: 282.3
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
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 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 + 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)	: 2340
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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
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 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]	: 5.95
Design pressure difference [MPa]	: 2.36

### 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	: 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]	: 4.35
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]	: -
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	: 2
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]	: 282.3
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
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 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 + 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)	: 3696
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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	: -
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	: Zircalloy2
Average fuel enrichment [% of U235]	: 3.7
Refuelling frequency [month]	: 1.3
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
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]	: 6.93
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 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	: 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 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	: Reinforced Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 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	: 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	: 2
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: 2
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
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 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 + 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)	: 2400
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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	: -
Reactor vessel overall length/height [m]	: 23
Inside shell diameter [m]	: 6
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	: Other - UO <sub>2</sub> /UO <sub>2</sub> -Gd <sub>2</sub> O <sub>3</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zircaloy2 tube lined with Zirconium
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]	: 4.8
Active core height/length [m]	: 3.7
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]	: 24.9
Fuel linear heat generation rate [kW/m]	: 44

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
Burnable neutron absorber material	: Boron/Hafnium
Burnable neutron absorber material specification	: -
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]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 6410

### 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	: 2
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	: 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]	: 2.5
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]	: 0.9
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]	: 7
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 6399

### 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
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	: 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
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	: 3

#### 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]	: 8
Total installed capacity of the on-site emergency power sources per unit [MW]	: 16
Total battery capacity [Ah]	: 7400

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 2079
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
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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	: AISI-TYPE-304
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 [%]	: 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	: Cadmium Alloy
Burnable neutron absorber material	: Gadolinium/Boron
Burnable neutron absorber material specification	: G/B
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]	: -
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]	: -
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]	: 4.5
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m3]	: 28
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 840

### 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]	: 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)	: 2
HPSI systems pressure [MPa]	: 11.4
LPSI system pressure [MPa]	: 4.1
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	: <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]	: 566.5
Rated apparent power [MVA]	: 630
Output voltage [kV]	: 19
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea
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]	: 5.7
Steam generator feedwater inlet temperature [°C]	: 273

**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	: -

**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)	: 360
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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]	: 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-4
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	: Cadmium Alloy
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: G/B
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]	: -
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]	: -
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]	: 4.5
Design pressure difference [MPa]	: 0.8

### Pressurizer

Total volume [m3]	: 28
Number of safety valves	: 2
Number of relief valves	: 2
Installed heater power [kW]	: 840

### 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]	: 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)	: 2
HPSI systems pressure [MPa]	: 11.4
LPSI system pressure [MPa]	: 4.1
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	: <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]	: 566.5
Rated apparent power [MVA]	: 630
Output voltage [kV]	: 19
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea
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]	: 5.7
Steam generator feedwater inlet temperature [°C]	: 273

#### 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	: -

#### 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)	: 444
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
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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/SFVQ1A
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
Reactor vessel overall length/height [m]	: 12.1
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 [%]	: 30
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	: Cadmium Alloy
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: G/B
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]	: 15.4
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]	: -
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]	: 4.5
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	: Spherical
Containment structure	: Steel
Pressure suppression system	: Spray
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 67900
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)	: 2
HPSI systems pressure [MPa]	: 16.7
LPSI system pressure [MPa]	: 4.5
HPSI system flowrate [t/h]	: -
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	: -
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
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]	: 5.3
Steam generator feedwater inlet temperature [°C]	: 269

**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	: -

**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]	: 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>
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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]	: -
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]	: 132
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: 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]	: 7.07
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]	: -
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	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 5700
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 2.85
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]	: -
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]	: 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]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
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]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

**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]	: -

**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>
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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]	: -
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]	: 132
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.07
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 [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]	: -
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]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 8700
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
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]	: -
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]	: 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]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
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]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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]	: -

#### 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>
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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]	: -
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]	: 132
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: 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]	: 7.07
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]	: -
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	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
Design leakage rate [% per day]	: -
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]	: -
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]	: 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]	: 6.68
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]	: 1100
Rated apparent power [MVA]	: <Not Applicable>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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]	: -

#### 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>
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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]	: -
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]	: 132
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: 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]	: 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]	: -
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	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
Design leakage rate [% per day]	: -
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]	: -
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]	: 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]	: 6.68
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]	: 1100
Rated apparent power [MVA]	: <Not Applicable>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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]	: -

#### 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>
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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]	: -
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]	: 132
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 185

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.07
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 [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]	: -
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]	: -

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>



Total containment volume [m3]	: 8700
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
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]	: -
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]	: 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]	: 6.68
HP cylinder Inlet steam moisture [%]	: -
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]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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]	: -

#### 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>
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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]	: -
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 39500
Active core diameter [m]	: 5.16
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 150
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	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50.6
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 18.8

#### 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	: 205

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.31
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]	: -
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	: Reinforced Concrete+Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### 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)	: 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	: 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	: -
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]	: 284
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 1356
Rated apparent power [MVA]	: <Not Applicable>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire 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)	: 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]	: -

#### 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>
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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]	: -
Refuelling frequency [month]	: 13
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 39500
Active core diameter [m]	: 5.16
Active core height/length [m]	: 3.71
Number of fissile fuel assemblies/bundles	: 150
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	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50.6
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 18.8

#### 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	: 205

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.31
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]	: -
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	: Reinforced Concrete+Steel
Pressure suppression system	: <Not Applicable>
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### 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)	: 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	: 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	: -
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]	: 284
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 1356
Rated apparent power [MVA]	: <Not Applicable>
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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	: 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	: -
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	: -
Cable segregation within the unit used for	: -
On-site fire brigade	: -
Off-site fire brigade response time	: -

#### 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]	: -

#### 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>
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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	: Cadmium Alloy
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
Number of condensers per turbine-generator	: 1
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]	: 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)	: 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]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 3.1
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>
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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	: Cadmium Alloy
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
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	: -
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 3.3
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>
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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	: Cadmium Alloy
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
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	: -
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 3.9
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>
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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	: Cadmium Alloy
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 [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	: -
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
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	: -
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 5.5
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
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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	: Cadmium Alloy
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> ]	: 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 [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 [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
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	: -
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 5.5
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
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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	: Cadmium Alloy
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 [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
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)	: 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	: -
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 7.1
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>
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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	: Cadmium Alloy
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 [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	: <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
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)	: 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	: -
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 7.1
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>
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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-533 GrB CL1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: ASME SA-371 ER309
Reactor vessel overall length/height [m]	: 21
Inside shell diameter [m]	: 5
Shell thickness [mm]	: 114
Number of 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	: Other - UO <sub>2</sub> /UO <sub>2</sub> -Gd <sub>2</sub> O <sub>3</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zircaloy2 tube lined with Zirconium
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]	: 3.3
Active core height/length [m]	: 3.7
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]	: 25.3
Fuel linear heat generation rate [kW/m]	: 44

#### Reactivity control

Control rod material	: Boron Carbide
Burnable neutron absorber material	: Boron/Hafnium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
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]	: <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]	: 29100

### 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	: 2
Pump motor rating [MW]	: -
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]	: -

### 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
LPSI system pressure [MPa]	: 1.1
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	: 2
HP cylinder inlet steam pressure [MPa]	: 7
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 2904

### 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
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]	: 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]	: 9
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	: 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	: 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)	: 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	: -
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>
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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	: SA-372
Reactor vessel overall length/height [m]	: 22
Inside shell diameter [m]	: 6
Shell thickness [mm]	: 138
Number of 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	: Other - UO <sub>2</sub> /UO <sub>2</sub> -Gd <sub>2</sub> O <sub>3</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zircaloy2 tube lined with Zirconium
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]	: 4.1
Active core height/length [m]	: 3.7
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 96
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> ]	: 50.5
Average fuel power density [kW/kgU]	: 25.1
Fuel linear heat generation rate [kW/m]	: 44

#### 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	: 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]	: 4740

### 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	: 2
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	: 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	: <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]	: 1
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	: 2
HP cylinder inlet steam pressure [MPa]	: 7
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 4551

### 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
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	: 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
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	: 3

#### 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)	: 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	: -
Number of 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
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>
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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	: SA-373
Reactor vessel overall length/height [m]	: 22
Inside shell diameter [m]	: 6
Shell thickness [mm]	: 138
Number of 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	: Other - UO <sub>2</sub> /UO <sub>2</sub> -Gd <sub>2</sub> O <sub>3</sub>
Refuelling type	: OFF-line
Moderator material	: H <sub>2</sub> O
Fuel clad material	: Zirconium Alloy
Fuel clad material specification	: Zircaloy2 tube lined with Zirconium
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]	: 4.1
Active core height/length [m]	: 3.7
Number of fissile fuel assemblies/bundles	: 560
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 96
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> ]	: 50.5
Average fuel power density [kW/kgU]	: 25.1
Fuel linear heat generation rate [kW/m]	: 44

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
Burnable neutron absorber material	: Boron/Hafnium
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]	: 6.93
Reactor outlet temperature [°C]	: 286
Reactor inlet temperature [°C]	: 216
Coolant mass flow at the rated power [t/h]	: 47400

### 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	: 2
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	: 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	: <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]	: 1
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	: <Not Applicable>
Number of LP cylinders per turbine	: 2
HP cylinder inlet steam pressure [MPa]	: 7
HP cylinder Inlet steam moisture [%]	: <Not Applicable>
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 4496

### 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
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	: 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
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	: 3

**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)	: 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
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>
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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]	: 4.1
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
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
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)	: 1870
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: Turbine Extraction
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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
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
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)	: 1360
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: Turbine Extraction
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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/SFVQ1
Vessel cladding material	: <Not Applicable>
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
Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: Liquid zone control
Number of control rod assemblies	: 89

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
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	: <Not Applicable>
Containment Shape	: <Not Applicable>
Containment structure	: Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray

Total containment volume [m3]	: 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
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium

Number of main condensate pumps	: -
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]	: 212.5

**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 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	: -
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)	: 1386
Interim storage facility type	: <Not Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: -

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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/SFVQ1
Vessel cladding material	: <Not Applicable>
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]	: 4.1
Refuelling frequency [month]	: 15
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 41000
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/Hafnium
Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: -
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: Liquid zone control
Number of control rod assemblies	: 205

### Reactor coolant system

Number of external reactor coolant loops	: <Not Applicable>
Coolant type	: H2O
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	: 1
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	: <Not Applicable>
Containment Shape	: Cylindrical
Containment structure	: Reinforced Concrete+Steel
Pressure suppression system	: Pools
Additional pressure suppression system	: Spray



Total containment volume [m3]	: 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
Number of condensers per turbine-generator	: 1
Condenser tube material	: Titanium

Number of main condensate pumps	: -
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]	: 215.7

**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	: 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)	: 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>
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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
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD 203
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: Liquid zone control
Number of control rod assemblies	: 97

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H2O
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 [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
Design pressure difference [MPa]	: 0.41

### 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	: Pools
Additional pressure suppression system	: <Not Applicable>

Total containment volume [m3]	: 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]	: -
LPSI system pressure [MPa]	: 0.98
HPSI system flowrate [t/h]	: -
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
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	: <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	: Turbine Extraction
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Number of heat connection points per unit	: 5
Number of intermediate circuits/heat exchangers	: 5
Total capacity of heat connections [MWt]	: 350
Extraction steam pressure [MPa]	: 1.413



## Design Characteristics

### Primary 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
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	: 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 [m3]	: 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]	: -

### 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
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
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	: <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	: Turbine Extraction
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Number of heat connection points per unit	: <Not Applicable>
Number of intermediate circuits/heat exchangers	: <Not Applicable>
Total capacity of heat connections [MWt]	: 978.9
Extraction steam pressure [MPa]	: 2.45

## Design Characteristics

### Primary 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	: Cadmium Alloy
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
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	: -
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 3.9
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>
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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	: Cadmium Alloy
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
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	: -
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 3.9
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>
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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>
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	: Cadmium Alloy
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]	: 5.1
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
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	: -
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 5.4
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
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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	: 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	: Cadmium Alloy
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
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	: -
Estimated time reserve of the batteries at full load [h]	: 2
Total installed capacity of the on-site emergency power sources per unit [MW]	: 5.4
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
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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]	: 2.2
Refuelling frequency [month]	: 12
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]	: 130.6
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 50
Average fuel power density [kW/kgU]	: -
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	: 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]	: 285
Reactor inlet temperature [°C]	: 277
Coolant mass flow at the rated power [t/h]	: 8100

### 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	: 3
Containment design pressure [MPa]	: 3.85
Design leakage rate [% per day]	: 0.5
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: 1
Number of LPSI systems	: 1
Number of hydroaccumulators	: 1
Number of core spray system pumps (BWR)	: 2
HPSI systems pressure [MPa]	: 2.6
LPSI system pressure [MPa]	: 2.0
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	: <Not Applicable>
Number of independent system divisions	: <Not Applicable>

## 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]	: 1790

### 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
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	: 2
Estimated time reserve 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>
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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]	: 3.40
Refuelling frequency [month]	: 15
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 31500
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	: Cadmium Alloy
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
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>
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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]	: 3.40
Refuelling frequency [month]	: 15
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 31500
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	: Cadmium Alloy
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
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>
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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	: SUS
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]	: 2.04
Refuelling frequency [month]	: 12
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	: 60
Fuel clad thickness [mm]	: 0.86
Average core power density [kW/dm <sup>3</sup> ]	: 40.6
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 15.18

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
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	: 73

### Reactor coolant system

Number of external reactor coolant loops	: 3
Coolant type	: H2O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.139
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]	: 4.35
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)	: 5
HPSI systems pressure [MPa]	: 9.1
LPSI system pressure [MPa]	: 1.6
HPSI system flowrate [t/h]	: -
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	: <Not Applicable>
Number of independent system divisions	: <Not Applicable>

## 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]	: 6.68
HP cylinder Inlet steam moisture [%]	: 0.28
HP cylinder inlet steam temperature [°C]	: 282
HP cylinder Inlet steam flow rate [t/h]	: 256

### 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
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]	: -

#### 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	: 2
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: 4000

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: <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>
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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]	: 2.6
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 35
Average discharge burnup [MWd/t]	: 48000
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> ]	: 104.7
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 17.9

#### Reactivity control

Control rod material	: Cadmium Alloy
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
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]	: 344
Operating coolant pressure [MPa]	: 15.8
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]	: -
Design heat transfer surface [m <sup>2</sup> ]	: 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 [m <sup>3</sup> ]	: 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]	: 4
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	: 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]	: 150
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]	: 5.87
HP cylinder Inlet steam moisture [%]	: 0.4
HP cylinder inlet steam temperature [°C]	: 273.6
HP cylinder Inlet steam flow rate [t/h]	: 1840

### 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
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]	: <Not Applicable>

#### 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	: 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	: -
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	: 2
Estimated time reserve of the batteries at full load [h]	: -
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: 3200

#### 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 Applicable>
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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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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-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]	: 15
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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al2O3/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	: 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]	: 8.1
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	: Digital
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
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]	: 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)	: 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]	: 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>
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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]	: 15
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
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 [m3]	: 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]	: 700
Output voltage [kV]	: 22
Output frequency [Hz]	: 60

### Main condenser

Primary means of condenser cooling	: Sea
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	: <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]	: 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>
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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
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
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>
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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
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
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>
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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
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]	: 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 [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 Applicable>



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
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
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>
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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_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
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
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>
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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

ULCHIN-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
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
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>
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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 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
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
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>
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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/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
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]	: 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
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)	: <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>
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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/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
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]	: 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
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)	: <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>
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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, 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]	: <Not Applicable>
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	: 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]	: 0.72
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
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]	: 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	: 7
Tube shape	: U-tube
Tube material	: Incoloy800
SG shell material	: SA516-70
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	: <Not Applicable>
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	: Pools

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	: <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]	: 0.59
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: 2182.0

### 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	: 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]	: 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
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 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)	: 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]	: 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)	: 505

**Non-electrical applications**

Primary heat connection	: <Not Applicable>
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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, 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]	: <Not Applicable>
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	: 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]	: 0.72
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
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]	: 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	: SA516-70
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	: <Not Applicable>
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	: Pools

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	: <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]	: 0.68
HPSI system flowrate [t/h]	: <Not Applicable>
LPSI system flowrate [t/h]	: 2182

### 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	: 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
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	: <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
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)	: 723.54

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
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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
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
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>
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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, 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
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
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>
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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	: 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
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>
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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
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
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>
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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	: 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
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
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>
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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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YONGGWANG-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
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
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>
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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	: 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
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
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>
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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	: 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
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
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>
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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>

LT-47

IGNALINA-2

LITHUANIA, REPUBLIC OF

## Design Characteristics

### Primary Systems

#### Reactor pressure vessel

Reactor vessel shape	: Cylindrical, Flat End
Reactor vessel centreline orientation	: Vertical
Reactor vessel material	: Stainless Steel
Reactor vessel material specification	: Reactor vessel is located in a quarter-shape metallic-concrete vault with metal
Vessel cladding material	: <Not Applicable>
Vessel cladding material specification	: <Not Applicable>
Reactor vessel overall length/height [m]	: 9.75
Inside shell diameter [m]	: 14.52
Shell thickness [mm]	: <Not Available>
Number of pressure channels	: 1661
Pressure channel material	: Zr+Nb(2.5%)
Pressure channel wall thickness [mm]	: 4

#### Reactor Core

Fuel assembly geometry	: Circular
Fuel Form	: Pellets
Fuel material	: UO <sub>2</sub> /Er <sub>2</sub> O <sub>3</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]	: 2.8
Refuelling frequency [month]	: <Not Applicable>
Part of the core refuelled [%]	: <Not Applicable>
Average discharge burnup [MWd/t]	: 23000
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]	: 188
Moderator weight [t]	: 1759
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.825
Average core power density [kW/dm <sup>3</sup> ]	: 5.42
Average fuel power density [kW/kgU]	: 22.5
Fuel linear heat generation rate [kW/m]	: 42.5

#### Reactivity control

Control rod material	: Boron Carbide
Burnable neutron absorber material	: Other - Erbium
Burnable neutron absorber material specification	: Er <sub>2</sub> O <sub>3</sub>
Soluble neutron absorber material	: <Not Applicable>
Secondary shutdown system	: Gd Injection
Number of control rod assemblies	: 211

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: 20.8
Operating coolant pressure [MPa]	: 6.86
Reactor outlet temperature [°C]	: 288
Reactor inlet temperature [°C]	: 259
Coolant mass flow at the rated power [t/h]	: 30600

### Steam generators (SG)/drum separators

Type of SG	: <Not Applicable>
SG output	: <Not Applicable>
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	: Plated carbon steel
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	: 4
Pump motor rating [MW]	: 5.6
Design pressure difference [MPa]	: 2

### Pressurizer

Total volume [m <sup>3</sup> ]	: <Not Applicable>
Number of safety valves	: 12
Number of relief valves	: 10
Installed heater power [kW]	: <Not Applicable>

### Containment systems

Containment type	: Confinement
Containment Shape	: <Not Applicable>
Containment structure	: Reinforced Concrete
Pressure suppression system	: Pools
Additional pressure suppression system	: <Not Applicable>



Total containment volume [m3]	: 55678
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	: 12
Number of LPSI systems	: <Not Applicable>
Number of hydroaccumulators	: 16
Number of core spray system pumps (BWR)	: <Not Applicable>
HPSI systems pressure [MPa]	: 8.33
LPSI system pressure [MPa]	: <Not Applicable>
HPSI system flowrate [t/h]	: 250
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	: Digital/Analog
Number of independent system divisions	: 2

## Secondary systems

### Turbine

Turbine type	: Superheated 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	: 4
HP cylinder inlet steam pressure [MPa]	: 6.4
HP cylinder Inlet steam moisture [%]	: 0.5
HP cylinder inlet steam temperature [°C]	: 279.5
HP cylinder Inlet steam flow rate [t/h]	: 4400

### Main generator

Rated active power [MWe]	: 800
Rated apparent power [MVA]	: 889
Output voltage [kV]	: 24
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Lake
Number of condensers per turbine-generator	: 4
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]	: 4.4

#### Feedwater system

Number of turbine driven main feedwater pumps	: <Not Applicable>
Number of motor-driven main feedwater pumps	: 7
Number of start-up feed-water pumps (if different from the auxiliary FWP)	: <Not Applicable>
Number of feedwater pumps required for full power operation	: 5
Feedwater discharge pressure [MPa]	: <Not Applicable>
Steam generator feedwater inlet temperature [°C]	: <Not Applicable>

#### Auxiliary / Emergency feedwater

Number of electrical motor-driven pumps	: 6
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)	: 4
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	: <Not Applicable>
Number of on site non-safety related gas turbines	: <Not Applicable>
Other on-site emergency AC power sources	: Emergency continuons power supply facility
Estimated time reserve of the batteries at full load [h]	: 1
Total installed capacity of the on-site emergency power sources per unit [MW]	: 33.6
Total battery capacity [Ah]	: 12600

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 7574
Interim storage facility type	: Dry
Interim storage facility capacity (number of spent fuel assemblies)	: 4998

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
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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	: -
Reactor vessel overall length/height [m]	: 21.1
Inside shell diameter [m]	: 5.23
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	: <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]	: 16
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 35000
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]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.813
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]	: 17.72

#### Reactivity control

Control rod material	: Boron Carbide
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	: 109

### 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]	: 286
Reactor inlet temperature [°C]	: 278.5
Coolant mass flow at the rated power [t/h]	: 4876

### 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]	: 3.9
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.84
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 3774

### Main generator

Rated active power [MWe]	: 674.5
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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-GR-B-CL-1
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 21.1
Inside shell diameter [m]	: 5.23
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	: <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]	: 22
Part of the core refuelled [%]	: 25
Average discharge burnup [MWd/t]	: 35000
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]	: -
Number of fuel elements per assembly/bundle	: 62
Fuel clad thickness [mm]	: 0.813
Average core power density [kW/dm <sup>3</sup> ]	: 49.15
Average fuel power density [kW/kgU]	: 34.3
Fuel linear heat generation rate [kW/m]	: 17.72

#### Reactivity control

Control rod material	: Boron Carbide
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	: 109

### 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]	: 286
Reactor inlet temperature [°C]	: 278.5
Coolant mass flow at the rated power [t/h]	: 4876

### 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]	: 3.9
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.84
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 280
HP cylinder Inlet steam flow rate [t/h]	: 3774

### Main generator

Rated active power [MWe]	: 674.5
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>
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Number of heat connection points per unit	: <Not Available>
Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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	: <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,PCA 2-6
Average fuel enrichment [% of U235]	: -
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]	: -
Fuel linear heat generation rate [kW/m]	: 20.26

#### 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	: 2
Coolant type	: H2O
Coolant weight [t]	: -
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	: <Not Available>
Number of SG	: 2
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	: 2
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	: <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]	: 4.9
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	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: 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]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Sea
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	: 2
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	: 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	: 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)	: <Not Available>
Number of on-site safety related gas turbines (available per unit)	: <Not Available>
Number of on site non-safety related diesel generator	: 1
Number of on site non-safety related gas turbines	: 1
Other on-site emergency AC power sources	: -
Estimated time reserve of the batteries at full load [h]	: 24
Total installed capacity of the on-site emergency power sources per unit [MW]	: -
Total battery capacity [Ah]	: -

#### Spent fuel storage

Reactor building spent fuel pool capacity (number of spent fuel assemblies)	: 130
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
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Number of heat connection points per unit	: <Not Available>
Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: <Not Available>
Extraction steam pressure [MPa]	: <Not Available>

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	: <Not Available>
Vessel cladding material specification	: -
Reactor vessel overall length/height [m]	: 10.7
Inside shell diameter [m]	: 3.374
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	: <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	: ZIRCALLOY-4
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: -
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]	: 35.917
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> ]	: 70.9
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 13.59

#### Reactivity control

Control rod material	: Cadmium Alloy
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	: 420

### 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]	: 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	: <Not Available>
Number of SG	: 2
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	: 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]	: 2.65
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	: 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]	: 5.34
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 268.3
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 325
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>
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Number of heat 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	: 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	: Cadmium Alloy
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 [m <sup>2</sup> ]	: -

### 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 [m <sup>3</sup> ]	: <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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.9
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 3.87
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
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>
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Number of heat 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
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
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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
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	: SB163NiFeCrUNSN <sub>o</sub> .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 [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	: 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
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
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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

RUSSIAN FEDERATION

## Design Characteristics

### Primary 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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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 [%]	: 33.3
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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 [%]	: 33.3
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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 [%]	: 33.3
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]	: -

### Main generator

Rated active power [MWe]	: 1000
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	: 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	: 2/3
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>
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Number of heat 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	: <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]	: 5.3
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
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	: -
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	: 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
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>
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Number of heat 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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RUSSIAN FEDERATION

## 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]	: -
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>
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>
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Number of heat 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	: 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>
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 [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>
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Number of heat 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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RUSSIAN FEDERATION

## 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>
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>
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Number of heat 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	: 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>
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>
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Number of heat 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	: 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	: 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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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	: 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	: 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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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	: 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	: 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]	: -

### Main generator

Rated active power [MWe]	: 1000
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	: 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	: 2/3
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>
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Number of heat 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	: 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
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Lake
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	: 2/2
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]	: 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>
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Number of heat 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	: 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
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Lake
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	: 2/2
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]	: 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>
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Number of heat 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	: 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
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Lake
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	: 2/2
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]	: 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>
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Number of heat 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	: 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
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: Lake
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	: 2/2
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]	: 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>
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Number of heat 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	: 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
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
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>
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Number of heat 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	: 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
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
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>
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Number of heat 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	: 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
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
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>
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Number of heat 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	: 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
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
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>
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Number of heat 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	: <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
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
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>
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Number of heat 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	: 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
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
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>
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Number of heat 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	: 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
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
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>
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Number of heat 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	: 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
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
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>
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Number of heat 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
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>
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Number of heat 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
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>
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Number of heat 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	: UO2
Refuelling type	: OFF-line
Moderator material	: H2O
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/dm3]	: 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	: <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]	: -
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	: 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	: 2/3
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>
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Number of heat 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	: 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
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
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>
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Number of heat 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	: 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
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
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>
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Number of heat 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	: 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
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
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>
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Number of heat 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 [%]	: 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
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]	: -
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	: 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	: 2/3
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>
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Number of heat 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-3

BOHUNICE-2

SLOVAK 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	: 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 [%]	: 23
Average discharge burnup [MWd/t]	: 35000
Active core diameter [m]	: 2.88
Active core height/length [m]	: 2.5
Number of fissile fuel assemblies/bundles	: 313
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> ]	: 94
Average fuel power density [kW/kgU]	: 32.7
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	: 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]	: 12.25
Reactor outlet temperature [°C]	: 295
Reactor inlet temperature [°C]	: 268
Coolant mass flow at the rated power [t/h]	: 42000

### 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 Applicable>
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	: Saturated steam
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]	: 256
HP cylinder Inlet steam flow rate [t/h]	: 376

### 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	: Cooling towers
Number of condensers per turbine-generator	: 2
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	: 2/2
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]	: 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>
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Number of heat 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/NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 23
Average discharge burnup [MWd/t]	: 35000
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]	: 12.9

#### Reactivity control

Control rod material	: Boron SS
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]	: 12.25
Reactor outlet temperature [°C]	: 295
Reactor inlet temperature [°C]	: 268
Coolant mass flow at the rated power [t/h]	: 42000

### 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	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: 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]	: 256
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	: 2/2
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]	: 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>
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Number of heat 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	: 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 [%]	: 23
Average discharge burnup [MWd/t]	: 35000
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]	: 12.9

#### Reactivity control

Control rod material	: Boron SS
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]	: 12.25
Reactor outlet temperature [°C]	: 295
Reactor inlet temperature [°C]	: 268
Coolant mass flow at the rated power [t/h]	: 42000

### 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	: <Not Available>

Total containment volume [m3]	: -
Number of containment spray pumps	: 3
Containment design pressure [MPa]	: -
Design leakage rate [% per day]	: 13
Type of H2 recombiner	: Passive

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: Saturated steam
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]	: 256
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	: 2/2
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]	: 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>
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Number of heat 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/NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 31000
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> ]	: 84.42
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 12.92

#### Reactivity control

Control rod material	: Boron SS
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]	: 12.23
Reactor outlet temperature [°C]	: 295
Reactor inlet temperature [°C]	: 268
Coolant mass flow at the rated power [t/h]	: 42000

### 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	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 256
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]	: -

### 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	: 2/2
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]	: 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>
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Number of heat 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/NB
Average fuel enrichment [% of U235]	: -
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 31000
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> ]	: 84.42
Average fuel power density [kW/kgU]	: 32.7
Fuel linear heat generation rate [kW/m]	: 12.92

#### Reactivity control

Control rod material	: Boron SS
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]	: 12.23
Reactor outlet temperature [°C]	: 295
Reactor inlet temperature [°C]	: 268
Coolant mass flow at the rated power [t/h]	: 42000

### 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	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 256
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]	: -

### 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	: 2/2
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]	: 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>
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Number of heat 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	: 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 [%]	: 44
Average discharge burnup [MWd/t]	: 44000
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]	: -
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
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>
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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>

ZA-1

KOEBERG-1

SOUTH AFRICA

## Design Characteristics

### Primary 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	: <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]	: 36500
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]	: 330
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
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	: 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	: 32

### 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]	: 323.2
Reactor inlet temperature [°C]	: 286.7
Coolant mass flow at the rated power [t/h]	: 47675

### 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+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.5
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]	: 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
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>
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Number of heat 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	: <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]	: 36500
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]	: 330
Number of fuel elements per assembly/bundle	: 264
Fuel clad thickness [mm]	: 0.57
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	: 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	: 32

### 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]	: 323.2
Reactor inlet temperature [°C]	: 286.7
Coolant mass flow at the rated power [t/h]	: 47675

### 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+Steel
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 0.5
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]	: 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	: <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>
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Number of heat 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
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>
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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
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
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>
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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	: <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]	: 12
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	: Cadmium Alloy
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	: <Not Available>
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]	: -
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	: <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]	: 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 Available>
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]	: 6.6
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River
Number of condensers per turbine-generator	: 2
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>
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Number of heat 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	: -
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	: <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]	: 12
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	: Cadmium Alloy
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	: 49

### 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	: <Not Available>
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]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m3]	: 39.6
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]	: 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 Available>
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]	: 6.6
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River
Number of condensers per turbine-generator	: 2
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>
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Number of heat 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	: 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
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	: -
Number of IP cylinders per turbine	: -
Number of LP cylinders per turbine	: -
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	: 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)	: <Not Available>
Interim storage facility type	: <Not Available>
Interim storage facility capacity (number of spent fuel assemblies)	: -

#### Non-electrical applications

Primary heat connection	: <Not Available>
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Number of heat 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	: Low Mn-Mo steel (ASME SA-302,GrB).
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-305
Reactor vessel overall length/height [m]	: 19.96
Inside shell diameter [m]	: 5.36
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	: 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]	: 24
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 31000
Active core diameter [m]	: 3.44
Active core height/length [m]	: 3.69
Number of fissile fuel assemblies/bundles	: 400
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 70.9
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 64
Fuel clad thickness [mm]	: 0.81
Average core power density [kW/dm <sup>3</sup> ]	: 40.6
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 15.16

#### Reactivity control

Control rod material	: Boron Carbide/Hafnium
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
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]	: 7.03
Reactor outlet temperature [°C]	: 283
Reactor inlet temperature [°C]	: 275
Coolant mass flow at the rated power [t/h]	: 21770

### 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 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	: Pools
Additional pressure suppression system	: Spray

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	: 2
Number of LPSI systems	: 4
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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]	: 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]	: 6.78
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 285
HP cylinder Inlet steam flow rate [t/h]	: 689

### Main generator

Rated active power [MWe]	: 460
Rated apparent power [MVA]	: 575
Output voltage [kV]	: -
Output frequency [Hz]	: 50

### Main condenser

Primary means of condenser cooling	: River
Number of condensers per turbine-generator	: 2
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 Applicable>
Interim storage facility capacity (number of spent fuel assemblies)	: <Not Applicable>

#### Non-electrical applications

Primary heat connection	: <Not Applicable>
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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	: 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]	:
Refuelling frequency [month]	: 12
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 33000
Active core diameter [m]	:
Active core height/length [m]	:
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]	:
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
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	: 3
Coolant type	: H2O
Coolant weight [t]	:
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	:
SG shell material	:
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]	:
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	:
Containment design pressure [MPa]	:
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	: 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>
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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]	:
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]	:
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
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]	: 15.8
Reactor outlet temperature [°C]	: 328.3
Reactor inlet temperature [°C]	: 291.6
Coolant mass flow at the rated power [t/h]	: 16477.7

### 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]	: 4929.3

### 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	: Spray
Additional pressure suppression system	: Vacuum Building

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	: 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]	: 6.8
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]	: 992
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat connection points per unit	: <Not Available>
Number of intermediate circuits/heat exchangers	: <Not Available>
Total capacity of heat connections [MWt]	: -
Extraction steam pressure [MPa]	: -

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]	: 21.7
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]	: 42000
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]	: 117.5
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]	: 13.4

#### 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	: 1
Containment design pressure [MPa]	: 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 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]	: 450

### 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
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 Available>
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Number of heat 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	: SIS 2333
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	: <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 [%]	: 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]	: -
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
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	: 161

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H2O
Coolant weight [t]	: -
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 [m2]	: <Not Applicable>

### Main coolant pumps/circulators

Total number of pumps/circulators	: 8
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	: 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]	: 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	: 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
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>
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Number of heat 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 [%]	: 25
Average discharge burnup [MWd/t]	: 42000
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]	: -
Number of fuel elements per assembly/bundle	: 91
Fuel clad thickness [mm]	: 0.605
Average core power density [kW/dm <sup>3</sup> ]	: 48.6
Average fuel power density [kW/kgU]	: 23.8
Fuel linear heat generation rate [kW/m]	: 17.5

#### Reactivity control

Control rod material	: Boron Carbide
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	: 169

### Reactor coolant system

Number of external reactor coolant loops	: <Not Available>
Coolant type	: H2O
Coolant weight [t]	: -
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 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	: 8
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	: 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]	: 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]	: 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	: <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>
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Number of heat 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
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
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>
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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
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
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>
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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
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: Boric Acid H3BO3
Secondary shutdown system	: H3BO3 Injection
Number of control rod assemblies	: 169

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H2O
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 [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]	: 0.63
Design pressure difference [MPa]	: 0.37

### 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]	: 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
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 Available>
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Number of heat 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-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
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
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>
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Number of heat 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
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
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>
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Number of heat 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
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
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>
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Number of heat 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
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
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>
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Number of heat 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]	: 3.1
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
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
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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
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	: 25

### 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]	: 15.5
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 [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]	: 3.1
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
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
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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
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>
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Number of heat 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>
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Number of heat 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	: <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 [%]	: 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
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 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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.8
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.75
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 284
HP cylinder Inlet steam flow rate [t/h]	: 1828

### Main generator

Rated active power [MWe]	: 188
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: River
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>
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Number of heat 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

CHIN SHAN-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	: <Not Available>
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	: <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]	: 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 Available>
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 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]	: 3.94
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: -

### Main generator

Rated active power [MWe]	: 636
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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-302-B
Vessel cladding material	: <Not Available>
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	: <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 [%]	: -
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
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 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]	: 3.94
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: -

### Main generator

Rated active power [MWe]	: 636
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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]	: 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
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
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>
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Number of heat 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
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	: <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>
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Number of heat 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]	: 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
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
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>
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Number of heat 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]	: 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
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	: <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>
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Number of heat 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-B1

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]	: 17.7
Inside shell diameter [m]	: 20
Shell thickness [mm]	: 3800
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	: 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]	: 14
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 19000
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]	: -
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	: -

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]	: 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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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	: 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	: -
Pressure channel material	: Manganese Steel
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]	: 14
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 18000
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
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]	: -
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	: -

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]	: 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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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	: 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]	: 18.3
Inside shell diameter [m]	: 13
Shell thickness [mm]	: 6400
Number of pressure channels	: -
Pressure channel material	: Carbon Steel
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]	: 4
Part of the core refuelled [%]	: 7.5
Average discharge burnup [MWd/t]	: 24000
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]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.37
Average core power density [kW/dm3]	: 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
Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: NONE
Soluble neutron absorber material	: <Not Available>
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]	: 4.22
Reactor outlet temperature [°C]	: 675
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 13700

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: MILD/CHROME/S/ST
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	: 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
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.53
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 16.3
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]	: 666
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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	: 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]	: 18.3
Inside shell diameter [m]	: 13
Shell thickness [mm]	: 6400
Number of pressure channels	: -
Pressure channel material	: Carbon Steel
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]	: 4
Part of the core refuelled [%]	: 7.5
Average discharge burnup [MWd/t]	: 24000
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]	: -
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
Burnable neutron absorber material	: <Not Applicable>
Burnable neutron absorber material specification	: NONE
Soluble neutron absorber material	: <Not Available>
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]	: 4.22
Reactor outlet temperature [°C]	: 675
Reactor inlet temperature [°C]	: 286
Coolant mass flow at the rated power [t/h]	: 13700

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: MILD/CHROME/S/ST
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	: 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
Pressure suppression system	: Vacuum Building
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.53
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 16.3
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]	: 666
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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	: 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]	: 18.3
Inside shell diameter [m]	: 13.1
Shell thickness [mm]	: 6400
Number of pressure channels	: -
Pressure channel material	: Carbon Steel
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]	: 4
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 24000
Active core diameter [m]	: 9.3
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]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.461
Average core power density [kW/dm <sup>3</sup> ]	: 2.64
Average fuel power density [kW/kgU]	: 13.6
Fuel linear heat generation rate [kW/m]	: 16.8

#### Reactivity control

Control rod material	: Boron SS
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: <Not Available>
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]	: 4.22
Reactor outlet temperature [°C]	: 651
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 13700

### 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	: Helical
Tube material	: MILD/CHROME/S/ST
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	: 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
Pressure suppression system	: Vacuum Building
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]	: 16.3
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]	: 666
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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-20B

HEYSHAM-A2

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]	: 18.3
Inside shell diameter [m]	: 13
Shell thickness [mm]	: 6400
Number of pressure channels	: -
Pressure channel material	: Carbon Steel
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]	: 4
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 24000
Active core diameter [m]	: 9.3
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]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.461
Average core power density [kW/dm <sup>3</sup> ]	: 2.64
Average fuel power density [kW/kgU]	: 13.7
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	: GD
Soluble neutron absorber material	: <Not Available>
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]	: 4.22
Reactor outlet temperature [°C]	: 651
Reactor inlet temperature [°C]	: 287
Coolant mass flow at the rated power [t/h]	: 13700

### 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	: MILD/CHROME/S/ST
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	: 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
Pressure suppression system	: Vacuum Building
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]	: 16.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1800

### Main generator

Rated active power [MWe]	: 666
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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	: 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]	: 21.9
Inside shell diameter [m]	: 20.3
Shell thickness [mm]	: 5762
Number of pressure channels	: -
Pressure channel material	: Carbon Steel
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]	: 3
Part of the core refuelled [%]	: 5
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	: 2592
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	: 36
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
Burnable neutron absorber material	: Gadolinium
Burnable neutron absorber material specification	: GD
Soluble neutron absorber material	: <Not Available>
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]	: 4.32
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	: <Not Available>
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Helical
Tube material	: CHR/SS
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	: 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
Pressure suppression system	: Vacuum Building
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]	: 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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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	: 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]	: 21.9
Inside shell diameter [m]	: 20.3
Shell thickness [mm]	: 5762
Number of pressure channels	: -
Pressure channel material	: Carbon Steel
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]	: 3
Part of the core refuelled [%]	: 5
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	: 2592
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	: 36
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 13.7
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	: GD
Soluble neutron absorber material	: <Not Available>
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]	: 4.32
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	: <Not Available>
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: CHR/SS
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	: 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
Pressure suppression system	: Vacuum Building
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]	: 16.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1800

### Main generator

Rated active power [MWe]	: 672
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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	: 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]	: 35.65
Inside shell diameter [m]	: 18.9
Shell thickness [mm]	: 5030
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	: 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]	: -
Part of the core refuelled [%]	: 2
Average discharge burnup [MWd/t]	: 27000
Active core diameter [m]	: 9.11
Active core height/length [m]	: 8.31
Number of fissile fuel assemblies/bundles	: 2464
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 105.2
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.381
Average core power density [kW/dm <sup>3</sup> ]	: 2.96
Average fuel power density [kW/kgU]	: 10.74
Fuel linear heat generation rate [kW/m]	: 14.32

#### 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	: 44

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: CO2
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 4.24
Reactor outlet temperature [°C]	: 655
Reactor inlet temperature [°C]	: 280
Coolant mass flow at the rated power [t/h]	: 13700

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: MILD/CHROME/S/ST
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 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]	: 16.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 495
HP cylinder Inlet steam flow rate [t/h]	: 1435

### Main generator

Rated active power [MWe]	: 660
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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	: 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]	: 35.65
Inside shell diameter [m]	: 18.9
Shell thickness [mm]	: 5030
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	: 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]	: -
Part of the core refuelled [%]	: 2
Average discharge burnup [MWd/t]	: 27000
Active core diameter [m]	: 9.11
Active core height/length [m]	: 8.31
Number of fissile fuel assemblies/bundles	: 2464
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 105.2
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.381
Average core power density [kW/dm <sup>3</sup> ]	: 2.96
Average fuel power density [kW/kgU]	: 10.74
Fuel linear heat generation rate [kW/m]	: 14.32

#### 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	: 44

### Reactor coolant system

Number of external reactor coolant loops	: 1
Coolant type	: CO2
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 4.24
Reactor outlet temperature [°C]	: 655
Reactor inlet temperature [°C]	: 280
Coolant mass flow at the rated power [t/h]	: 13700

### Steam generators (SG)/drum separators

Type of SG	: <Not Available>
SG output	: <Not Available>
Number of SG	: 8
Number of drum separators	: <Not Applicable>
Tube shape	: Straight
Tube material	: MILD/CHROME/S/ST
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 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]	: 16.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 495
HP cylinder Inlet steam flow rate [t/h]	: 1435

### Main generator

Rated active power [MWe]	: 660
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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	: 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]	: 19.35
Inside shell diameter [m]	: 18.9
Shell thickness [mm]	: 5000
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	: 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]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 21000
Active core diameter [m]	: 9.11
Active core height/length [m]	: 8.29
Number of fissile fuel assemblies/bundles	: 2464
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 105
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 14.3
Fuel linear heat generation rate [kW/m]	: 16.9

#### 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	: 44

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 4.04
Reactor outlet temperature [°C]	: 639
Reactor inlet temperature [°C]	: 282
Coolant mass flow at the rated power [t/h]	: 13000

### 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	: 8
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 Concrete
Pressure suppression system	: Vacuum Building
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]	: 16.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1786

### Main generator

Rated active power [MWe]	: 660
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>
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Number of heat 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	: 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]	: 19.35
Inside shell diameter [m]	: 18.9
Shell thickness [mm]	: 5000
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	: 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]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 21000
Active core diameter [m]	: 9.11
Active core height/length [m]	: 8.29
Number of fissile fuel assemblies/bundles	: 2464
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 105
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 36
Fuel clad thickness [mm]	: 0.38
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 14.3
Fuel linear heat generation rate [kW/m]	: 16.9

#### 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	: 44

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 4.04
Reactor outlet temperature [°C]	: 639
Reactor inlet temperature [°C]	: 282
Coolant mass flow at the rated power [t/h]	: 13000

### 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	: 8
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 Concrete
Pressure suppression system	: Vacuum Building
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]	: 16.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1786

### Main generator

Rated active power [MWe]	: 660
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>
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Number of heat 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	: 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]	: 18.3
Inside shell diameter [m]	: 23.5
Shell thickness [mm]	: 4600
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]	: 5430
Active core diameter [m]	: 12.8
Active core height/length [m]	: 8.5
Number of fissile fuel assemblies/bundles	: 26464
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 293.7
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 8
Fuel clad thickness [mm]	: 2.4
Average core power density [kW/dm <sup>3</sup> ]	: 0.74
Average fuel power density [kW/kgU]	: 2.34
Fuel linear heat generation rate [kW/m]	: 27

#### 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	: 65

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 2.66
Reactor outlet temperature [°C]	: 365
Reactor inlet temperature [°C]	: 220
Coolant mass flow at the rated power [t/h]	: 17855

### 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]	: -
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	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -



Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.96
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 2.7
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 350
HP cylinder Inlet steam flow rate [t/h]	: 1071

### Main generator

Rated active power [MWe]	: 313
Rated apparent power [MVA]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Sea
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>
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Number of heat 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	: 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]	: 18.3
Inside shell diameter [m]	: 23.5
Shell thickness [mm]	: 4600
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]	: 5470
Active core diameter [m]	: 12.8
Active core height/length [m]	: 8.5
Number of fissile fuel assemblies/bundles	: 26464
Number of fertile fuel assemblies (for FBR, N/A for other reactors)	: <Not Applicable>
Fuel weight [t]	: 293.7
Moderator weight [t]	: -
Number of fuel elements per assembly/bundle	: 1
Fuel clad thickness [mm]	: 2.4
Average core power density [kW/dm <sup>3</sup> ]	: 0.74
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: 27

#### 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	: 65

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 2.66
Reactor outlet temperature [°C]	: 365
Reactor inlet temperature [°C]	: 220
Coolant mass flow at the rated power [t/h]	: 17855

### 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]	: -
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	: Spherical
Containment structure	: Steel
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.96
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 2.7
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 350
HP cylinder Inlet steam flow rate [t/h]	: -

### Main generator

Rated active power [MWe]	: 313
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>
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Number of heat 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/SA-533
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS
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
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]	: 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	: 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
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	: 21

### 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]	: 323.4
Reactor inlet temperature [°C]	: 292.4
Coolant mass flow at the rated power [t/h]	: 69000

### 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
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	: 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]	: 3.4
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	: 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]	: 6.71
HP cylinder Inlet steam moisture [%]	: -
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]	: -
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>
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Number of heat 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	: 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]	: 21.9
Inside shell diameter [m]	: 20.28
Shell thickness [mm]	: 5762
Number of pressure channels	: -
Pressure channel material	: Carbon Steel
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]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 29500
Active core diameter [m]	: 9.31
Active core height/length [m]	: 8.29
Number of fissile fuel assemblies/bundles	: 2656
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	: 36
Fuel clad thickness [mm]	: 0.37
Average core power density [kW/dm3]	: 2.76
Average fuel power density [kW/kgU]	: 14.3
Fuel linear heat generation rate [kW/m]	: 17.8

#### 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	: 44

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 4.23
Reactor outlet temperature [°C]	: 635
Reactor inlet temperature [°C]	: 298
Coolant mass flow at the rated power [t/h]	: 15120

### 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	: 8
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 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]	: 16.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1890

### Main generator

Rated active power [MWe]	: 682
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>
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Number of heat 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	: 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]	: 21.9
Inside shell diameter [m]	: 20.28
Shell thickness [mm]	: 5762
Number of pressure channels	: -
Pressure channel material	: Carbon Steel
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]	: -
Part of the core refuelled [%]	: -
Average discharge burnup [MWd/t]	: 29500
Active core diameter [m]	: 9.31
Active core height/length [m]	: 8.29
Number of fissile fuel assemblies/bundles	: 2656
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	: 36
Fuel clad thickness [mm]	: 0.37
Average core power density [kW/dm <sup>3</sup> ]	: 2.76
Average fuel power density [kW/kgU]	: 14.3
Fuel linear heat generation rate [kW/m]	: 17.8

#### 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	: 44

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: CO2
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 4.23
Reactor outlet temperature [°C]	: 635
Reactor inlet temperature [°C]	: 298
Coolant mass flow at the rated power [t/h]	: 15120

### 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	: 8
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 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]	: 16.3
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 538
HP cylinder Inlet steam flow rate [t/h]	: 1890

### Main generator

Rated active power [MWe]	: 682
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>
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Number of heat 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	: <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
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
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>
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Number of heat 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-13B

WYLFA 2

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> ]	: 0.85
Average fuel power density [kW/kgU]	: -
Fuel linear heat generation rate [kW/m]	: -

#### 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	: 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]	: 234
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	: <Not Available>
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	: -
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]	: -

### Main generator

Rated active power [MWe]	: 335
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>
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Number of heat 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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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	: 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]	: -

### Main generator

Rated active power [MWe]	: 1000
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	: 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	: 2/3
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>
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Number of heat 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/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
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>
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Number of heat 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	: UO2
Refuelling type	: OFF-line
Moderator material	: H2O
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/dm3]	: 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 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>
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Number of heat 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
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]	: -
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	: 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	: 2/3
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>
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Number of heat 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
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]	: -
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	: 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	: 2/3
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>
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Number of heat 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
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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 SS
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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 SS
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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 SS
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 [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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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 SS
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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 SS
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]	: -
Output voltage [kV]	: -
Output frequency [Hz]	: -

### Main condenser

Primary means of condenser cooling	: Lake
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	: 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	: 2/3
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>
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Number of heat 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
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]	: -
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	: 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	: 2/3
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>
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Number of heat 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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ARKANSAS ONE-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]	: 4.15
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: -
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>
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Number of heat 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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ARKANSAS ONE-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
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]	: 3.8
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 12
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
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]	: 3.8
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 12
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
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]	: 3.8
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
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]	: .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	: <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>
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Number of heat 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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
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 [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	: 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]	: .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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.9
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.9
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 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	: <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>
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Number of heat 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]	: 12
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.9
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.4
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]	: 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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -



Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.4
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]	: 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	: <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>
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Number of heat 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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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
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]	: .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	: <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>
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Number of heat 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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 25

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.5
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 [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	: 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]	: .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	: <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>
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Number of heat 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
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]	: 3.4
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]	: 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	: <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>
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Number of heat 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
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]	: 3.52
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
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]	: 3.52
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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-413

CATAWBA-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]	: 12.7
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]	: 12
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
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]	: 2.04
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 12
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
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]	: 2.04
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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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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
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]	: .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	: <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>
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Number of heat 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-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]	: 12
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
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]	: 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	: <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>
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Number of heat 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
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 [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.03
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
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]	: 1.03
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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-298

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]	: 12
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.1
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]	: 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	: <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>
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Number of heat 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	: SS-18-8
Reactor vessel overall length/height [m]	: 12.4
Inside shell diameter [m]	: 4.35
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]	: 32
Part of the core refuelled [%]	: 33
Average discharge burnup [MWd/t]	: 36000
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
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> ]	: 79.6
Average fuel power density [kW/kgU]	: 29.9
Fuel linear heat generation rate [kW/m]	: 18.67

#### 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	: 8

### 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]	: 317
Reactor inlet temperature [°C]	: 291
Coolant mass flow at the rated power [t/h]	: 19986

### 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	: Reinforced Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 5.5
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]	: 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]	: 6.328
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 297
HP cylinder Inlet steam flow rate [t/h]	: 4819

### Main generator

Rated active power [MWe]	: 890
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>
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Number of heat 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-346

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
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 [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.8
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
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]	: 3.31
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]	: 267.3
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	: <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>
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Number of heat 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
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]	: 3.31
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]	: 267.3
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	: <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>
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Number of heat 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-315

DONALD 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
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]	: 1.9
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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-316

DONALD 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
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]	: 1.9
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
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]	: .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	: <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>
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Number of heat 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
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]	: .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	: <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>
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Number of heat 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-331

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]	: 32
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.36
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.68
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	: <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>
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Number of heat 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

ENRICO 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
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]	: 4.4
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]	: 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	: <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>
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Number of heat 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-348

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
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]	: 3.8
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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-364

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
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]	: 3.8
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.4
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]	: 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	: <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>
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Number of heat 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
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]	: 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	: 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	: <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>
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Number of heat 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]	: 16
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.05
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.925
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	: <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>
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Number of heat 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

H.B. 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
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]	: 2.95
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.35
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	: -
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]	: 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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.35
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	: -
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]	: 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	: <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>
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Number of heat 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
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]	: 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]	: 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	: <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>
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Number of heat 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
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	: <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>
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Number of heat 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
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]	: 3.3
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]	: 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	: <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>
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Number of heat 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-305

KEWAUNEE

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
Reactor vessel overall length/height [m]	: 11.9
Inside shell diameter [m]	: 3.35
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 [%]	: 33
Average discharge burnup [MWd/t]	: 38900
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]	: 46.1
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> ]	: 94.9
Average fuel power density [kW/kgU]	: 30.4
Fuel linear heat generation rate [kW/m]	: 20.82

#### Reactivity control

Control rod material	: Cadmium Alloy
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	: 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]	: 315
Reactor inlet temperature [°C]	: 279.9
Coolant mass flow at the rated power [t/h]	: 15467

### 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	: Double
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]	: 3.22
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	: 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]	: 4.95
HP cylinder Inlet steam moisture [%]	: -
HP cylinder inlet steam temperature [°C]	: 263
HP cylinder Inlet steam flow rate [t/h]	: 3007

### Main generator

Rated active power [MWe]	: 582
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>
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Number of heat 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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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
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]	: .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	: <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>
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Number of heat 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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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
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]	: .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	: <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>
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Number of heat 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
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]	: .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	: <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>
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Number of heat 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-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
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]	: .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	: <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>
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Number of heat 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]	: 12
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
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]	: 2.04
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 13
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
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]	: 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	: <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>
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Number of heat 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]	: 20
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
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]	: 4.83
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 21
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
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]	: 1.7
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 18
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
Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: 7/ASS
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 121

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 7.17
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 [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]	: -
Design pressure difference [MPa]	: -

### Pressurizer

Total volume [m <sup>3</sup> ]	: 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	: -
Additional pressure suppression system	: -

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	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 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	: <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>
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Number of heat 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/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]	: 22
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 4.36
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.79
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	: <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>
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Number of heat 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]	: 16
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
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]	: 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	: <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>
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Number of heat 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
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]	: 3.16
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]	: 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	: <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>
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Number of heat 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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
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]	: -
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 [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]	: -
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 [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.16
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]	: 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	: <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>
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Number of heat 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
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]	: 5.13
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 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]	: 30.9
Fuel linear heat generation rate [kW/m]	: 19.06

#### Reactivity control

Control rod material	: Cadmium Alloy
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]	: 5.13
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
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]	: 5.13
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
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]	: .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	: <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>
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Number of heat 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
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]	: 3.87
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
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]	: 4.5
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]	: 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	: <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>
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Number of heat 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
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]	: 4.5
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]	: 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	: <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>
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Number of heat 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]	: -
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
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]	: 4.5
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]	: 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	: <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>
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Number of heat 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	: 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
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]	: .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	: <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>
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Number of heat 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	: 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
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]	: .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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.05
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.97
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 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	: <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>
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Number of heat 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]	: 12
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
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]	: 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	: 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	: <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>
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Number of heat 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]	: 12
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
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]	: 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	: 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	: <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>
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Number of heat 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]	: 20
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	: Cadmium Alloy
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 2.91
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 5.06
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	: <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>
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Number of heat 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 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]	: 20
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	: Cadmium Alloy
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 2.91
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 5.06
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	: <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>
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Number of heat 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
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]	: .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	: <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>
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Number of heat 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
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]	: .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	: <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>
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Number of heat 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]	: 8
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
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]	: 4.23
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.05
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 282.4
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	: <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>
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Number of heat 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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.8
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 [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	: 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]	: 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]	: 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	: <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>
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Number of heat 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
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]	: 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]	: 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	: <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>
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Number of heat 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-361

SAN ONOFRE-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]	: 13.22
Inside shell diameter [m]	: 4.81
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]	: 33000
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]	: 0.641
Average core power density [kW/dm <sup>3</sup> ]	: 70.4
Average fuel power density [kW/kgU]	: 37.9
Fuel linear heat generation rate [kW/m]	: 18.4

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B-4C
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 83

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
Reactor outlet temperature [°C]	: 321.6
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 16818

### 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	: 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]	: 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]	: 278
HP cylinder Inlet steam flow rate [t/h]	: 6523

### Main generator

Rated active power [MWe]	: 1181
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>
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Number of heat 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-533-B/SA-508
Vessel cladding material	: Stainless Steel
Vessel cladding material specification	: SS-304
Reactor vessel overall length/height [m]	: 13.22
Inside shell diameter [m]	: 4.81
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]	: 33000
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]	: 0.641
Average core power density [kW/dm <sup>3</sup> ]	: 94.9
Average fuel power density [kW/kgU]	: 37.9
Fuel linear heat generation rate [kW/m]	: 18.4

#### Reactivity control

Control rod material	: Boron Carbide/Cadmium Alloy
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B-4C
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 49

### Reactor coolant system

Number of external reactor coolant loops	: 2
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
Reactor outlet temperature [°C]	: 321.6
Reactor inlet temperature [°C]	: 289
Coolant mass flow at the rated power [t/h]	: 16818

### 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	: 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]	: 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]	: 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]	: 278
HP cylinder Inlet steam flow rate [t/h]	: 6523

### Main generator

Rated active power [MWe]	: 1181
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>
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Number of heat 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]	: 12
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
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]	: 3.7
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
Burnable neutron absorber material	: Others
Burnable neutron absorber material specification	: WABA/IFBA
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.82
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 [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	: 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	: <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>
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Number of heat 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
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	: <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>
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Number of heat 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

SHEARON 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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: B <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	: 52

### 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]	: 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 [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]	: -
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 [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.2
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]	: 6.56
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	: <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>
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Number of heat 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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSILICATE
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 29

### 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]	: 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 [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	: Steel+Concrete
Pressure suppression system	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.97
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
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]	: 3.97
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
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]	: 3.1
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]	: 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	: <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>
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Number of heat 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
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 [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.1
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]	: 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	: <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>
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Number of heat 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
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]	: 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	: 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	: <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>
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Number of heat 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
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]	: 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	: 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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.72
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.69
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	: <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>
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Number of heat 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]	: 18
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.72
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.69
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	: <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>
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Number of heat 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	: -
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
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]	: .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	: <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>
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Number of heat 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
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]	: 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]	: 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	: <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>
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Number of heat 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
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]	: 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]	: 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	: <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>
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Number of heat 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]	: 16
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
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	: -
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 3.9
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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]	: 6.68
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	: <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>
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Number of heat 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
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]	: 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	: <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>
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Number of heat 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
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]	: 3.65
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	: 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	: <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>
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Number of heat 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
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]	: 3.65
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	: 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	: <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>
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Number of heat 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]	: 12
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
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]	: 3.09
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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]	: 12
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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: BOROSIL GLASS
Soluble neutron absorber material	: Boric Acid H <sub>3</sub> BO <sub>3</sub>
Secondary shutdown system	: -
Number of control rod assemblies	: 33

### Reactor coolant system

Number of external reactor coolant loops	: 4
Coolant type	: H <sub>2</sub> O
Coolant weight [t]	: -
Operating coolant pressure [MPa]	: 15.71
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 [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	: Steel+Concrete
Pressure suppression system	: Ice Condenser
Additional pressure suppression system	: -

Total containment volume [m3]	: -
Number of containment spray pumps	: -
Containment design pressure [MPa]	: 1.05
Design leakage rate [% per day]	: -
Type of H2 recombiner	: -

### Emergency core cooling systems

Number of HPSI systems	: <Not Available>
Number of LPSI systems	: <Not Available>
Number of hydroaccumulators	: <Not Available>
Number of core spray system pumps (BWR)	: <Not Available>
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	: <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>
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Number of heat 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
Burnable neutron absorber material	: Boron
Burnable neutron absorber material specification	: Al2O3/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]	: 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]	: 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	: <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>
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Number of heat 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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